

THE TINPLATE INDUSTRY

THE
Tinplate Industry

WITH SPECIAL REFERENCE TO
ITS RELATIONS WITH THE
IRON AND STEEL INDUSTRIES

A Study in Economic Organisation

BY

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TO THE MEMORY
OF MY FATHER

PREFACE

THE historical portion of this volume was prepared during the tenure of the Fellowship of the University of Wales, 1904-6, but pressure of other work and the call of deeper interests delayed for some years the examination of modern problems of organisation.

The investigation covers a wider field than the title suggests. For, in the days before steel bar was employed as raw material, the iron and tinplate industries were practically one, while to-day many so-called tinplate factories are largely engaged in the manufacture of steel and galvanised sheets, and in many cases steel bar, tinplate, and sheet manufacture is carried on in the same factory. Nothing has been written on profits. The reason is that the information gathered on this point was given in confidence I am not aware that any of the firms are public companies whose shares are quoted on the market, and whose accounts are published

It is not unlikely that many errors have crept in. Apparently no investigation had previously been made of the economic problems connected with this industry, and to discover sources of information and evaluate the material were matters of considerable difficulty. But all utilised was subjected to the available tests, and documentary evidence was employed wherever possible. The

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implications contained in the written material often proved more valuable than the evidence which such material was intended to provide

In the chapter on the method of production I have quoted largely from two excellent papers by Mr. G. B. Hammond and Mr. Beaumont Thomas. A considerable portion of the section dealing with present conditions is based upon personal investigation, and in this connection I am deeply indebted to many relatives and friends, employers, managers and other officials, workmen and trade union officials, merchants and others. Two of those who rendered the greatest assistance, my father and Mr C. Taliesyn Rhys, have since passed away. My warmest thanks are due to Messrs. D J Thomas and W T. Morris for many technological and other facts; to Messrs Tom Griffiths and Ivor H Gwynne for their readiness to discuss labour questions relevant to the investigation, and for facilitating the examination of the trade unions now existing; to my colleague, Mr Hector J. W Hetherington, for reading the manuscript and suggesting several improvements, to Miss K. H. Mellor and Mr Dan T. John for revising statistics and verifying quotations; and to the Editor of the "Economic Journal" for permission to make use of articles already published in the Journal. The most useful statistical tables are to be found in the Appendices.

LANDORE,
May, 1914

INTRODUCTION

Few industries so simple in character as that of tinplate manufacture present so many problems of interest to the economist. The student of tariff policies will agree that no better illustration can be found of the application of the "infant industry" argument for protection. The United States "infant," born less than twenty-five years ago, has now outgrown the parent industry of South Wales. The ardent protectionist will discover much to make him rejoice if he examine American tinplate history, and nearly as much to make him weep in a study of German development—or absence of it! The convinced Free Trader will find food for sad reflection in the history of the nineties in South Wales, but the abundant evidence of recuperative power which subsequent movements afford may leave him on good terms with his theory.

To the geographer South Wales presents an extremely interesting study as a producing area. The iron industry was first attracted to that part by the presence of iron ore, and a plentiful supply of wood for making charcoal. Later, when pit-coal was introduced, the district possessed still greater attracting power. The tinplate industry was first established—in the 18th century—to provide a market for the iron produced locally, it was in every way subsidiary to the iron industry.

The tinplate mill was but an appendage to the forge, and the latter manufactured other forms of iron products as well as the bars destined to be converted into sheets and coated with tin in the former. Gradually, after the middle of the 19th century, steel displaced iron in many markets, and the forge became increasingly dependent upon the tinplate mill. Early in the eighties, steel was also substituted for iron bar used in tinplate manufacture, and the iron industry dwindled.

Mr J. S Jeans informs us¹ that South Wales does not enjoy the best of natural facilities for the production of steel. This statement is true of the Bessemer steel industry, located among the hills of north Glamorgan, although the Bessemer factories are not wholly devoted to the manufacture of tinplate bars. But it is not true of the highly specialised Siemens steel industry, of which tinplate and sheet bars form the main—almost the only—product. Most of the Siemens factories are situated near the coast, in and around Swansea. There the cost of assembling raw materials—pig-iron produced locally, brought coastwise from Scotland and Middlesborough, or imported from Germany and America, and coal mined in the neighbourhood—is exceedingly low. It is, of course, obvious that the low cost of distributing the product to the local tinplate factories is an important factor in favour of the steel industry of South Wales. But it is by no means the only factor. Not only does Mr. Jeans confine his attention to the actual cost of manufacture of tinplate bar, but he would probably limit his reference to the Bessemer steel industry, and exclude

¹ *The Iron Trade of Great Britain*

the greater one. Nevertheless, it is undoubtedly true to say that the iron industry attracted the tinplate industry, and that the latter in turn created the steel industry. Some of the natural facilities which attracted and fostered the growth of the iron industry no longer exist, and some of the existing advantages in steel manufacture are "artificial" or "acquired," *i.e.*, they have been brought into existence by capital expenditure made profitable through the development of the main industries. Thus it may be said that the steady growth of each is due partly, though not wholly, to the momentum provided by an early start.

The most important of the acquired advantages enjoyed by South Wales in tinplate manufacture is the presence of a supply of highly skilled labour. That this is a vital consideration is abundantly proved by the difficulty experienced by the Americans in establishing the industry in their country twenty years ago, by the difficulty in this direction which the German manufacturers state they still meet with, and by the fact that the Russian factories are largely operated by Welshmen.

Iron ore, which was once obtained in the district, and tin, which was in earlier years brought from Cornwall, are now imported from abroad¹. Coal is still supplied from the mines of South Wales, but it is sometimes conveyed a considerable distance by rail.

An interesting fact is that when South Wales did enjoy the earliest natural advantages the

¹ Foreign tin is now preferred to the Cornish article, and is exclusively used in this industry.

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plates were sent coastwise to Liverpool, and re-shipped abroad; but when those advantages passed away Liverpool ceased to be the main exporting centre. Swansea grew in importance, a Metal Exchange was opened in the town, and shipping facilities were enormously increased. There does not seem to have been any causal relation between the two phenomena - it is probably a coincidence.

The history of the labour associations provides material which will repay examination by the student of industrial democracy. Tinplate workers are now said to be the best organised in the country, and over 99 per cent. of them belong to one or other of six unions. The position presents curious features. When the wage-protecting association of "direct labour" finally died of starvation in 1898, after a riotous existence, some of the men, instead of joining with the rest to form one union for the trade, or separate unions for the main departments, became members of organisations which already existed in other trades: the remainder formed a new and independent union. Shortly afterwards a Conciliation Board was formed upon which the various unions and the masters' association were represented. This board, although slightly modified in structure, is still in existence, and during the last fourteen years has done admirable work. In short, the recent history of the trade provides an excellent example of extremely successful collective bargaining under difficulties so great, that at first they appeared to be almost insuperable.

The social pathologist will not find so much to interest him in the trade. Men, women, boys and girls are employed. The majority of the factories

are well appointed; the wages paid for skilled labour are uniformly high, and the conditions of employment generally satisfactory. Piece-workers, who are in a large majority, work eight hours a day; the work is fairly congenial, and most of it calls for considerable skill. The average tinplate worker is highly intelligent and a keen politician. Many of his class read widely, and are enthusiastic book collectors. As a body, they form perhaps the largest group of Welshmen employed in manufacture—for the industry is still mainly in the hands of bilingual descendants of natives. They possess the well-known Welsh characteristics, imagination, enthusiasm, and lack of perseverance; they also possess the lesser known but equally pronounced ones—they are as cynical as most peoples imbued with the spirit of idealism, and they possess a capacity for organisation and construction which has not yet been fully recognised. It is to the combination of imaginative and constructive powers—perhaps they should not be separated—that the sustained success of the present method of collective bargaining is probably due. It is lack of perseverance that partly explains the failure of the wage-protecting association in the important part played by it in the drama of the nineties.

The separation of the tinplate industry from the iron, and the creation of a separate steel industry in the eighties; the periodic dumping of steel bar from Germany and America during the last decade; the present movement towards "vertical integration," *i.e.*, the interlocking of interests of steel and tinplate manufacturers; the probable relations of the two industries in the future, and the relations

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between the Siemens and Bessemer steel factories, provide an interesting and fruitful subject of investigation to the student of industrial organisation.

The present is a period of transition. There are strong forces in operation which, acting alone, would tend to produce conditions favourable to an organisation similar to those already existing in the Scotch steel and South Wales Siemens steel industries. But there are checks, or counteracting forces; and these are likely to operate, even to grow stronger, for some time to come. Nevertheless changes are taking place; a silent revolution is in progress. The forces in operation producing and determining the nature of these changes will need careful examination.

The manufacture of tinplate forms one of the most stable trades in the country. It depends for its markets mainly upon foreign countries, and only about a quarter of the annual production is retained in the United Kingdom. Until 1890 more than 70 per cent. of the exports went to the United States. But the imposition of a high tariff under the McKinley Act of that year led to the establishment of an American industry, which, before the close of the century, was able to produce all the plates consumed in that country; and for the next dozen years the rebate trade (*i.e.*, in plates re-exported, upon which 99 per cent. of the tax is returned) alone remained in the hands of the South Wales manufacturers. Signs are not wanting that the American trust is making a serious attempt to capture this trade, if not also to oust its British rivals from the Canadian market. This is being done by charging differential prices. The trust is probably losing something on these orders, and

recouping itself by charging higher prices for plates intended for home consumption. The loss of rebate orders in the summer of 1911 was not at first a serious matter to the British makers, for the books of all seem to have been filled with orders from other buyers, and inquiries were plentiful. But the difficulty which has since been experienced in re-capturing them gives room for uneasiness. The complete loss of the rebate orders would involve considerable hardship, for America remained the largest single market; and the absence of such orders during the present year (1913) is one of the most important factors contributing to the existing depression.

The foreign markets are now numerous, and a considerable number are important. In most of them British manufacturers enjoy a complete monopoly, while in others they meet with no serious competition. Germany—to take one example—possesses a small tinplate industry of her own; there are in all five factories. But the producing capacity is increasing more slowly than the demand, and at no time was it more than sufficient to supply a comparatively small proportion of the needs of the Empire. German prices, which are ruled by a Kartel, generally follow import prices, German manufacturers supply a portion of the market, but make no attempt to supply the remainder. Here, then, the South Wales makers enjoy a monopoly which is not likely to be challenged for some time, and wide variations in prices are possible. In South Africa, South America, China, and other places the British monopoly is as complete for the time being as if imports from countries other than our own were prohibited. There is no competition.

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beyond that of South Wales makers among themselves

The tinplate industry resembles in some respects the larger and better known industries in the steel group, such as the manufacture of rails, ship-plates, boiler-plates, sheet-bars, etc. Like these it is engaged in the production of goods which are not intended for immediate and final consumption by the purchaser. It is useful for some purposes to draw a distinction (which, however, must not be pressed too far) between two classes of industries comprising the iron and steel group. In the one class the manufactured products (*e.g.*, steel rails) become the fixed capital employed in other trades; while in the other they (*e.g.*, ship-plates, boiler-plates, sheet-bars, etc.) appear as the raw material of the next link in the chain of industries. The second group may be further subdivided. Boiler-plates are used to construct boilers, ship-plates are used to build ships; that is, some of these raw materials are, in the next or a subsequent stage of manufacture, converted into fixed capital. And this is partly true of tinplates. In some cases they, like corrugated iron and sheet steel, are used for roofing purposes; and the buildings covered by them are fixed capital. But in the main tinplates do not become part of the fixed capital of another industry. They are mostly used for canning and casing purposes, and the commodities which they protect consist of "final consumption goods"; in other words, the industry is much nearer the end of the chain than are those mentioned above.

This distinction is of some importance, since it suggests an explanation of the apparently strange fact that while nearly all other industries suffered

from the depression of trade in 1908,¹ the volume of production in the tinplate industry of South Wales was scarcely affected. Industries near the beginning of the chain, such as those engaged in the manufacture of steel rails, and others, such as shipbuilding, suffer very acutely during periods of depression. The producing capacity is based upon anticipated demand; but since the real demand is determined in the long run by the wants of the buyers of the final consumption goods, the estimate, which is often made long in advance, is rarely accurate.

Further, such industries are highly capitalistic. Either the standing charges are very heavy, and the labour cost comparatively small, as in the manufacture of Bessemer steel; or the unit of production is for other reasons a large one, as in shipbuilding. One finds, therefore, comparatively few factories, each with an enormous producing capacity. To increase this capacity is to increase it considerably. Supply increases by large increments rather than small, and over-production generally means serious over-production. The danger of the evil occurring seems to vary directly with the seriousness of the evil itself.

Moreover, the demand for such commodities is not steady and continuous, but fluctuates violently. The demand for steel rails, for example, may vary between wide limits, and is likely to be exaggerated during periods of expansion of trade. In brisk

¹ I have omitted to deal with the effect of the system of competition, for it is irrelevant to the question here discussed. Competition may intensify the evil; but the evil itself is created by the capitalistic as distinct from the competitive system. It would exist under any system now possible, provided a real attempt were made to satisfy the wants of the consumer. Production is, and must be, for a more or less remote future demand.

times, too, new steel cars may be substituted for the older wooden ones, as in America in recent years. But in periods of bad trade the depression itself is accentuated by the policy, generally adopted, of "holding off"—of postponing demand as long as possible. No new enterprises are started in those periods, while too little improvement of plant is made. In short, the total demand for a long period (or, in other words, the real demand of the community) instead of being distributed evenly over that time, is concentrated upon a portion of it.

For these reasons it is generally found that in such industries as we have been considering the producing capacity is greater than the demand justifies; taking a complete trade cycle, or the period from good trade to good trade, the total demand could be met by fewer factories, *i.e.*, smaller expenditure on fixed capital. The industries are over-capitalised in a special sense; the products are manufactured at a higher cost than is really necessary.

In the tinplate industry the conditions are different. In the first place, the expenditure on fixed capital is less per unit of output. There are a large number of factories; each of them has comparatively small producing capacity, and new ones can be erected fairly rapidly and at a relatively small cost. Again, the producing capacity of a factory is increased by the addition of mills rather than by a complete revolution of the method of production. In short, the potential supply is capable of gradual increase; it can be adjusted to a slowly changing demand. The importance of this consideration becomes evident when we compare

the tinplate and steel-bar industries. At present there are over 550 tinplate mills in South Wales, so that the proportionate increase in the supply is very slight when one mill is added; the unit of increase is very small. The steel bar, which is used as the raw material, is made in what is known as a bar mill. A modern bar mill, equipped with the most efficient appliances, is capable of producing 2,250 tons of steel bars per week.

An average tinplate mill will turn out rather more than forty tons of plates in the same time. Consequently, a modern bar mill can supply fifty-six tinplate mills with all the bars required, and ten such mills would be sufficient to supply the trade. An over-supply of one bar mill would therefore be a serious evil, and a considerable increase in the producing capacity of the tinplate industry would be necessary to justify the erection of a new one. This constitutes one of the main difficulties at present. South Wales Siemens bars are either scarce or too plentiful; the output falls behind or runs ahead of requirements. It is true that the output of a bar mill may be increased by minor improvements in the factory; but as a rule the incentive to such improvements is the desirability of reducing cost rather than the readiness to meet a slowly increasing demand.¹ Moreover, such an increase is only possible within narrow limits.²

¹ The price of tinplate bar is regulated by the Siemens Bar Association. The incentive to reduce cost is greater during periods of depression, when increased supplies are not required, than during periods of prosperity and high prices.

² This paragraph is based upon the assumption that the steel-works contains sufficient furnaces to supply all the ingots necessary to keep the rolling plant fully employed. Assuming six furnaces to be necessary for this purpose, it is obvious that the producing capacity of a factory containing three or four can be largely increased by the

In the second place, an examination of the uses of tinplate will show that the total demand itself is not liable to great fluctuations. A tinplate is a thin sheet or plate of steel coated with tin. The covering of tin protects the sheet "from the action of vegetable acids."¹ It "is convenient for transport, cheap, clean and non-absorbent, is easily made up into any form, is air and water-tight when soldered, and combines maximum of strength with minimum of weight and bulk."² The chief single use of tinplates is for casing petroleum. It is estimated "that out of the total exports of 7,099,020 cwts. in 1905, 2,300,000 cwts were used for this purpose. Other uses to which they are put are the manufacture of dairy utensils and the canning of food, such as beef in America, salmon in Canada and the United States, mutton and fruit in Australia, fruit in California, oysters and lobsters on the American Continent, sardines, and peas and other vegetables in France, Spain, Italy, and Portugal, pine-apples in Mauritius and Singapore, milk in Switzerland, and many other articles. In addition it is well known that the introduction of stamping machinery has led to tinplates being more largely used for an increasing variety of purposes, such as the packing of biscuits, cakes, tobacco, sweets, etc."³ Terneplates are thin sheets

addition of furnaces, without any serious modification of the rolling plant. But when the limit has been reached any further increase will necessitate a second rolling mill. And the expenditure of capital thus called for would only be undertaken if a number of new furnaces were added, i.e., the producing capacity would be enormously increased. Few steel-works in South Wales have two rolling mills. The student of economic theory will realise that until the limit indicated is reached the law of increasing returns operates very strongly, and that the curve illustrating the costs for various outputs is of somewhat peculiar shape.

¹ F. W. Gilbertson "The Nineteenth Century" Vol 54

² G B Hammond "Journal of the Iron and Steel Institute," 1897.

³ R. Beaumont Thomas. "The Manufacture of Tinplates," 1906

of steel covered with a mixture of tin and lead. This coating protects the sheets from atmospheric oxidation. The plates are extensively used in America for roofing purposes, and in Lancashire for packing dry goods.

Tinplates are generally used to pack consumption goods. Many of these articles of consumption are conventional necessaries; the demand for them is fairly stable, and generally inelastic within limits, *i.e.*, it is not seriously affected by small changes in price. The demand for tinplate is determined by the demand for these consumable commodities, and is, therefore, itself inelastic within those limits. It is true that a failure of the fruit harvest and other causes may affect the available supply of the articles which are packed, and so the demand for tinplate; but an increase in their number, and a development of the trade in canned goods in different countries make for stability. Moreover, the total demand for canned goods is not only stable over long periods but also continuous. Their production keeps pace with the actual demand; consequently the demand for tinplates, and, therefore, the producing capacity in the industry, will, under normal conditions, keep pace roughly with the needs of the community for the consumption goods. Again, the cost of manufacturing tinplate is but a small proportion of the total cost of the consumption goods, *e.g.*, the cost of the tin case is but a small part of the price of tinned salmon. Consequently, a small rise or fall in the price of tinplates will not affect the price of tinned salmon or fruit; even a considerable change in the price of the former will not affect the price of the latter sufficiently to influence sales to any appreciable extent. In other words, the demand

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for tinplate over a long period is extremely inelastic in relation to conditions affecting its own production.

This statement seems to be opposed to facts, and needs further examination. At one time manufacturers were fond of saying, in reply to the demands of their workmen, that the market would not bear an increase in wages, *i.e.*, that an increase in price would mean a serious fall in demand. To some extent this was true. Wooden tea-chests gave way to cases made of tin in the middle of the nineties. The low prices ruling during that period suggested a new use for the commodity. And it is quite possible that an abnormal increase in prices might result in the restitution of wooden chests. Again, glass bottles and papier-maché might be used more extensively than they are now. Where substitutes exist, the demand for tinplate is naturally elastic. Nevertheless, it is probably true to say that within fairly wide limits of price, the total demand is extremely inelastic.

The argument of the manufacturers was partly due to a failure to distinguish between the market demand and the real demand of the consumers. The latter is inelastic, the former elastic. This will be more fully considered later. It was also partly due to a confusion of elasticity of demand with competition among themselves.

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THE TINPLATE INDUSTRY

CHAPTER I EARLY HISTORY¹

THE origin of the Tinplate Industry is obscure, and its early history difficult to trace. In the Books of Moses reference is frequently made to brass, an alloy of copper and tin. Pliny, again, mentions the art of coating copper with tin, while the Vasa Stannea of the Romans seem to have been copper vessels covered with that metal.

Flower states that² "It may be considered certain that the manufacture of Tinplates was commenced in Bohemia between the dates 1240 and 1600, following the discovery of Tin mines in the Erzgebirge mountains in the former year by a Cornish tin-miner, who fled or was banished from England, some say on account of religion, others for murder." Another writer informs us that "Little real progress was made in the art of tinning plates till about the year 1600. British tin was for a long time sent into Germany, from whence this country imported plated or tinned iron; and to Germany or Bohemia must, in all

¹ For the purposes of this short chapter on the beginnings of the industry in this country no attempt was made to consult contemporary writers (except Yarranton). For this volume is almost entirely devoted to modern developments, and the investigation really started with that period (1865-74) during which the main problems of organisation took the shape they still possess. The emphasis throughout is on organisation rather than history. For this reason many recent events, interesting in themselves, have found no place in this volume.

² P. W. Flower. "A Short History of the Trade in Tin" London, 1880.

probability, be referred the invention of an art now become of such utility, and in the practice of which the English and Welsh workmen have long been acknowledged to surpass those of every other country. The art of tinning is said to have been carried from Bohemia into Saxony about the year 1620, by a Catholic clergyman, who had embraced the Lutheran religion. In 1640 King Charles was informed that a tin mine was discovered in Barbary, and being on that account apprehensive of the progress of his revenue from the tin mines of Cornwall and Devonshire (a duty of Two pounds for every One thousand pounds weight being payable to the Dukes of Cornwall) by proclamation prohibited the importation of foreign tin, as also the carrying in English shipping the tin of Barbary to any other place whatever; also, for the promotion of the consumption of English tin and pewter in his realms he directed that all measures for wine, ale, beer, etc., to be used in taverns, victualling houses, shops, etc.; should be of tin or pewter and be stamped or sealed. Ever since this date the publicans' measures have been made from an alloy of tin and lead."¹

In 1676, Andrew Yarranton,² who has been called "the founder of English Political Economy,"³ published a book of considerable interest and importance, entitled "England's Improvement by Sea and Land," in which he devoted a long chapter to a description of the German tinplate industry, and showed that the manufacture of tinplate could be carried on even more successfully in this country than on the Continent.

At this time England was suffering from depression of trade, which Yarranton explained in the fashion of a mercantilist. "The neglect of the improvements of . . . minerals and manufactures," he wrote, "are the causes

¹ Article by D. Edwards on Tinplate Making. Official Guide Book. British Association, 1880

² An interesting account of Yarranton's life is to be found in "Industrial Biography," by Samuel Smiles (Murray, London, 1879 Chap. IV.)

³ P E Dove "Elements of Political Science." Edinburgh, 1854.

of the lowness of the prices and rents of lands, increases the poor, and brings a decay in shipping and commerce; and by consequence weakens that nation, and makes others rich and strong to their detriment.” Under the circumstances it seemed to Yarranton “cruel” that the country should be in such a depressed state. “God and nature hath fitted us with two most advantageous minerals in this nation, for the procuring of wealth and riches, and putting the poor on work; and in places so well posted (for quickness and ease in carriage and re-carriage by Sea) that it would make men amazed, that those materials should (at this time) be under *no better improvements*. One of these rich (yet neglected) minerals is our tin in Cornwall, which place lies upon the sea, and thereby the commodity may (at all times) be shipt, either on the French or Spanish coasts, or for Ireland. And at this time that commodity of tin was so low that in Cornwall tin gives not above three pounds ten shillings the cwt. The second material is the Roman Cinders and Iron Stone, in the Forest of Dean, in the County of Gloucester, which makes the best iron for most uses in the world, and works up to the best advantage, with delight and pleasure to the workman.”

As far back as 1625 the iron trade had been in a very unsatisfactory state. Wood for charcoal burning had become very scarce and expensive, while pit-coal had not yet been introduced in iron manufacture. “English made iron was under-sold in the London market by iron imported from Sweden, Germany and France . . . the iron workers were being thrown on the parish for support, the iron masters were reducing their stocks and establishments.”¹

In Cornwall a worse state of things prevailed, and “great distress existed amongst the sixty thousand people who depended upon the Tinplate trade for support, some of the workmen being positively in want of food and sustenance, and some of the employers being very short of money, although actually possessed of important

¹ Flower, p 40

quantities of tin, which to all intents and purposes was valueless until it was coined or stamped, which was only possible twice in the year.”¹

Yarranton, who probably had an intimate knowledge of trade, realised that if a tinplate industry were established in this country a market would be created for the iron and tin. Germany seems to have been in a prosperous condition during this period, and Saxony and part of Bohemia supplied all the known world with tinplates. “Trade is there become a great commodity, and thereby all that barren and mountainous country is become exceedingly rich and populous.”²

About 1660 Yarranton consulted with “a person of much riches,³ and one that was very understanding in the iron manufacture, who was pleased to say ‘that he had often designed to get that trade for making tinplates into England, but never could find out (by any) the way of making them.’”

In the end, a group of interested persons advanced sufficient money to enable Yarranton to proceed to Germany for the purpose of examining the process of manufacture. Accompanied by a foreman, “that well understood the whole nature of iron,” and another, who acted as interpreter, he visited the seat of the German industry. To his surprise the task he had set himself proved easy of accomplishment. “We were very civilly treated; and, contrary to our expectation, we had much liberty to view and see the works go, with the way and manner of their working and extending the place; as also the perfect view of such materials as they used in clearing the plates to make them fit to take tinn, with the way they use in tinning them over, when cleared from their rust and blackness.” After his return to England experiments were conducted⁴ with considerable success. “Several parcels were made . . . and all the workmen

¹ Flower, p 40

² Yarranton

³ Probably one of the Hanbury family of iron manufacturers of Pontypool, Monmouthshire

⁴ Apparently at Pontypool

that wrought upon them " agreed " that the plates, and the mettal they were made of was much better than those plates which were made in Germany; and would work more pliable, and serve for many more profitable uses, than the German plates would do."

Yarranton and his partners then prepared " to set this beneficial thing at work, for the improvement of our own minerals, and setting the poor at work." But they were prevented from continuing the manufacture; for " it being understood at London (and as only it doth in all these cases) a patent was trumped up, whereby this making of tinplates was granted " to a person of influence. " And what with the patent being in our way, and the richest of our partners being not willing, or at least afraid, to offend the great men then in power, who had their eye upon it, caused the thing to cool, and neither thereof proceeded by us, nor possibly could be done by him that had the patent with such as countenanced it. . . ." The author was probably referring to one William Chamberlaine, who took out the patent in 1673 for " a newe arte, mistery, or invencion of great use, etc., for plateing and tynning of Iron, Copper, Steele, and Brasse, as also for compressing and plateing of all other mettals."

No attempt seems to have been made to use the powers offered by the patent, and we read that eighteen years later (1691) new patent rights for fourteen years were granted to a certain John Hemingway to the sole use of an invention for " makeing of iron plates tynned over, commonly called tynned plates."¹ Apparently Hemingway did not successfully undertake the manufacture of tinplates, and for the next thirty years England continued to depend entirely upon Germany for the commodity.

In 1720 Major John Hanbury restarted the works at Pontypool, at which the experiments had been conducted nearly fifty years before, and where there was an excellent

¹ G B Hammond "The Manufacture of Tinplates Journal of the Iron and Steel Institute," No 2, 1897.

supply of water power and iron. MacPherson, in his "Annals of Commerce" (1801), relates that "among the projects called bubbles, of the year 1720"¹ appeared one "for working tinplates, or whitened iron plates."² The factory at Pontypool seems to have been "the earliest of such works in England which were permanently successful."³ But even this venture did not prosper at once. The German method of manufacture (which was copied by Hanbury) was slow and laborious. Hot slabs of iron were hammered into sheets by means of a "helve or tilt-hammer."⁴ But in 1728 the method of rolling plates was discovered, by which the quality of the product was vastly improved. And it was more to this invention, and to the introduction of coal, than to anything else that the expansion of the industry in the 18th century was due.

Soon, other manufacturers in Monmouthshire and Glamorganshire added tinplate departments, and the industry spread rapidly westwards. Before 1754 several factories had been erected in Swansea Valley, where coal was already being mined and copper had been manufactured for at least a century and a half.⁵

By 1776 we had begun to export to Gibraltar,⁶ although we still imported from Germany. By the end of the century, however, not only had we ceased to import, but we were actually exporting to the country from which the secret of manufacture had been obtained.

Little remains to be said of the history of the first seventy years of the 19th century. The main interest lies in the technological changes which took place, and which are dealt with in the next chapter. With the changes in the methods of manufacture the quality of

¹ Vol. II 606

² Vol. II. 97.

³ Ure. "Dictionary of Arts and Manufactures."

⁴ Hammond

⁵ Kitchen's Historical Extracts, 1754 Quoted in the Official Guide and Handbook to Swansea and District Swansea, 1880

⁶ Whitworth. "State of the Trade of Great Britain in its Imports and Exports, progressively from the year 1697" (London, 1776)

the article was improved and the cost of production reduced. New uses were found for it and fresh markets discovered. Tables, taken from Porter—"Progress of the Nation" and Flower—"A Short History of the Trade in Tin," are given in the Appendices, indicating the expansion of the factories westwards, and showing that the growth of exports was fairly steady and continuous.

CHAPTER II

METHOD OF PRODUCTION

IN some of the later chapters reference will be made to the different stages of production and the different groups of tinplate workmen, as well as to changes in methods of manufacture and their effects upon the various classes of operatives. It may be well, therefore, to give, in broad outline, the method now generally adopted in the manufacture of tinplate, together with some of those employed until recently. Technological details may not be interesting to the general reader, or the student of commercial development, yet to ignore them completely would but increase the difficulty of understanding the causes of recent progress, and add to the perplexity of the reader during an examination of some of the disputes between masters and workmen. The process of manufacture is comparatively simple; most of the methods employed in each stage have been universally adopted, and the final product is "standardised," and easily graded.

A tinplate factory is divided into two main departments, the "mills" and the "tinhouse." In the former the steel or tinplate bar is rolled into sheets or plates, cleaned, and prepared for tinning. When ready for tinning the plates are called "finished blackplates." In the latter the blackplate is coated with tin, tested and prepared for the market. The earliest American factories, which were called "dipperies," consisted only of the tinhouse. The finished blackplates were imported into the States from South Wales. We shall find later that the policy of British manufacturers of exporting blackplates was a subject of much dispute during the operation of the McKinley Tariff Act, and was one of the main causes

of the collapse of the workmen's union of those days and the formation of separate unions for the two branches of manufacture. It is more convenient for our purpose to regard the mills as divided into two sections, which may be called the "rolling" and the "intermediate" departments. In the former the steel bar is converted into "rough blackplate," and in the latter the rough blackplate is pickled, annealed, and converted into "finished blackplate."

THE MILLS

In the 17th century the process of manufacturing black-plate was exceedingly slow and laborious. Hot slabs of iron were flattened out "under a quick action helve or tilt-hammer, the pieces as reduced in thickness, being doubled over and piled with other pieces reduced in the same way, the surface being sprinkled with powdered coal or charcoal to prevent welding, the hammering being continued until the required size and thickness were obtained."¹ No improvement upon this cumbrous method was devised until 1728, when John Payne invented the process of rolling iron plates.² Plates manufactured by this process "possessed a finer surface, were more uniform in thickness, softer and more pliable in working, and were much esteemed by the consumers of the time."³ Payne's invention has been the only one which involved a complete revolution in the rolling department. Many improvements have been devised since his day, but all these have affected the details of manufacture rather than the fundamental process.

Until about thirty years ago tinplates were manufactured from iron bars, produced in charcoal forges and puddling furnaces, which, in most cases, were attached to the tinplate works. These forges and furnaces were generally part of the tinplate factory, and the two stages of manufacture—the production of iron bar and its

¹ Hammond

² Ure. "Dictionary of Arts, Manufactures, and Mines." 1875, Vol. III

³ Hammond

conversion into tinplate—formed practically one industry.¹ The substitution of mild steel for iron between 1880-1886 resulted in disintegration, and tinplate manufacture is now said to commence with the rolling department, in which the bar is converted into blackplate. The truck conveying the raw material is discharged near the bar-cutting machine, by which the long heavy bar is cut into pieces of suitable size. The pieces are short, “of a convenient weight to handle, and adapted to the size of the plate a multiple of which it is proposed to roll.”² The rolling department consists of a number of mills placed in a row in a long building. The driving power is supplied by a powerful engine placed in the middle of this row, and fed by boilers in a boiler-room immediately behind the engine and outside the main building. A mill consists of two pairs of rolls, two heating furnaces, a pair of doubling shears, placed almost in front of the rolls (*i.e.*, between the furnaces and the rolls but not in line with them), and a pair of squaring shears, placed behind the rolls. Behind the squaring shears is a bench, on which the packs of plates are opened by girls.

The rolls are made of tough cast iron “chilled to a depth of about $\frac{3}{4}$ of an inch all over the body.”³ One pair is used for “roughing” and the other for finishing purposes. The men employed at each mill consist of a rollerman, doubler, shearer, furnaceman, and receiver (sometimes called “catcher” or “behinder”). The shearer is assisted by three girls, who work at the opening bench. The rollerman is in charge of the mill and controls the operations of the rest of the group.

The process of rolling plates, which is comparatively simple, is briefly and clearly described by Mr. Hammond as follows :—

“The rough bars from the steel-works, of suitable gauge, varying from $\frac{1}{4}$ to $\frac{3}{4}$ inch thick and 7 to 10 inches in width, are

¹ *Vide* Chap III.

² Hammond

³ R. Beaumont Thomas: “The Manufacture of Tinplates” A Paper read before the Institute of Mechanical Engineers, August, 1906

cut into short lengths corresponding with the width of the plates to be produced, and are placed in the first or thick-iron furnace, and when heated to redness are delivered to the roller, who passes each piece several times between the roughing rolls; the catcher, stationed behind the rolls, catches the pieces as they pass through, and returns them over the top roll. When sufficiently extended, the pieces are replaced in the same furnace, and heat equivalent to that lost in the operation of rolling is restored. When they are again extended by rolling, the doubler doubles the two ends of each piece together, flattening the piece under the squeezer, by which it should be observed the substance for resistance in the next operation of rolling is not diminished. In this stage the pieces are known as 'doubles.' The doubles are now charged into the second or finishing furnace, leaving the thick-iron furnace free to heat another charge of rough bars while the operation of finishing the former is continued. When the 'doubles' are heated, the pieces are again extended, the second doubling is performed, and the uneven ends are cut off at the shears; 'fours' being thus produced. The packs are again subjected to the action of the finishing furnace and prepared for final rolling, or the process is continued after further rolling and doubling to 'eights,' as may be necessary for the gauge required. It is customary in every instance after two or more thicknesses of doubled plates have been rolled together to separate them before re-heating, care being taken to replace the pieces in position in the pack; this avoids welding of the surfaces and facilitates the final separation or opening of the finished sheets. It is known that each piece of rough bar of given weight, if carefully manipulated, will produce so many sheets of the desired size and gauge, and considerable skill is required to obtain sufficient length and at the same time to avoid exceeding it, or the steel would cut to waste. When the roller is satisfied that he has obtained the above requirements, the pieces are placed on trolleys for conveyance to the finishing shears, and when cool are cut by the shearer into the sizes of the order in hand "¹

The final operation in the rolling department is that of separating the eight sheets contained in each pack. This task is performed by girls—three to each mill—who open the upper edges, with an iron cleaver when necessary, and then tear the sheets apart by hand.

¹ A more elaborate description is given by Mr Thomas in his paper to the members of the Institute of Mechanical Engineers. But the above account, being less technical, is more easily apprehended by the general readers.

The operations in the mill appear to be largely mechanical, but the work of each man calls for considerable physical powers and a fairly high degree of skill. The rollerman, who manipulates the screws controlling the rolls, performs work of much responsibility, demanding a considerable amount of training and experience. A poor workman, by breaking rolls frequently, adds much to the cost of converting bar into rough blackplate. Above the mill workers is the roll-turner, whose function it is to make the necessary calculations for determining the margin allowed in the size and weight of the bar for the production of sheets of a given size; to turn the rolls when the surface has become uneven through much use, and generally to supervise the work performed in his department. One roll-turner is able to take charge of several mills.

In the second or intermediate department, the rough blackplate is converted into finished blackplate by means of pickling, annealing and cold-rolling. The first operation, which is known as "black pickling," is necessary to remove the black scale of oxide of iron which invariably appears on the surface of the plates in the mills. For a long time the cumbrous process of pickling by hand in leaden vats was universally employed.¹ But about thirty years ago mechanical methods were generally adopted, and considerable economies were effected in the use of acid. The operation is now performed "by means of machines provided with cradles, in which the plates are packed on their edges in bulk, for immersion

¹ "The first plan adopted for cleaning and preparing the iron for tinning was to scour the plates with sand and water, and file off the rough parts, then cover with resin and dip them in the melted tin. About 1747, the plates, after being cold rolled, were soaked for a week in the lees of bran, which had been allowed to stand in water about ten days, to become by fermentation sufficiently acid, and then scoured with sand and water. In 1760, the plates were pickled in dilute muriatic acid, before annealing, and cleansed with dilute sulphuric acid after being taken out of the bran lees. About 1745, an improvement of great importance was made in this process by one Moseley, who had tinworks in Staffordshire, which was the use of the 'Grease Pot.' This was introduced into South Wales in the year 1747" (Edwards)

first in diluted sulphuric or hydrochloric acid to remove the scaly oxide, and afterwards in water to wash off all traces of acid; a quick vertical, horizontal, or rocking motion being conveyed to the cradles to permit the liquid to circulate through and pass between the plates under treatment.”¹

“The rack, or cradle, presented to the machine” by a turn-table is “transferred (full of plates to be treated) to the acid tank; the cradle in the acid tank is transferred to the water tank, and the cradle in the water tank is deposited on the turn-table, full of plates treated and washed.”² The machine imparts a double motion to the cradles; for the latter are raised from the table or tank, revolved until suspended over the required tank or table and then lowered. The machine is controlled by a man known as the “pickler.” He is assisted by men and women, who convey the plates to and from the department and load and unload the cradles. The work is unskilled, but is carried on under very unpleasant conditions.³ At this stage the steel is too hard, and requires to be softened, in order that its surface may be more easily polished for receiving the coating of tin. This is done by a process of annealing, for which the plates, after leaving the pickling machine, are piled on cast-steel or wrought-iron stands, and covered with inverted boxes of the same material. The boxes, which are made air-tight by being sealed with sand, are then deposited in a reverberatory furnace by means of forked carriages, and subjected to a mild flame for about ten hours. The plates are afterwards allowed to cool gradually, and when quite cold are ready for cold-rolling.

This process, which is necessary to “remove any buckle or unevenness from the plate and to produce a flat, bright, polished surface for receiving the coating of tin,”⁴ consists of passing the plates separately through

¹ Hammond, p 8

² Thomas.

³ See Chap X

⁴ Hammond

highly polished chilled rolls. "At each pair of rolls a boy sits on a stool with a pack of plates resting on his knees and on a guide between the housings. He then deals the plates one by one, in rapid succession, through the rolls, using his hand and thumb to separate or feed the plates singly. Behind, the plates are picked up by another boy and carried back to the next line of rolls, where they are dealt through in the same way, and carried back to the last line of rolls. Each plate thus gets three passes, one in each line of rolls."¹ But this process causes the plates to become hard and unyielding, and a second or "white" annealing is necessary to make them pliable. The method employed is the same as before, but the heat to which the boxes are subjected is less intense, while the period for which they are allowed to remain in the furnace is only about seven hours. When cool the plates are again soft and pliable, and possess a brightly polished and even surface. In this state they are called "finished" blackplates, and are sometimes exported to foreign countries, there to be coated with tin. In case any oxide may have formed on the surface during the annealing process, the plates are once more pickled.

The machine employed in the second or "white" pickling process is similar to that employed in the first, but a weaker acid solution is used. Finally, the plates are removed from the cradles of the pickling machine and deposited in tanks of clear water, where they remain until they are immersed in the "tinpot."

Men alone are employed at the annealing furnaces, but women and girls assist the boys at the "cold-rolls" by carrying the plates to the stands and removing them when they have passed through the rolls. The proportion of youthful workers is much larger in this department than in any other.²

¹ Thomas.

² See Chap. X.

THE TINHOUSE

The method of manufacturing blackplate has changed very little since the early part of the 19th century. Improvements in detail have been introduced, but while these have reduced the cost of production and improved the quality of the output they have scarcely affected the main process. Nor have they created labour problems of serious difficulty. Not only does the character of the men's work remain the same, but the number of men required at each stage of the process remains practically unchanged. There has been little, if any, displacement of labour; there has been no demand for unskilled men working at machines to replace men doing highly skilled manual work.

In the tinning department, however, changes have occurred in the method of manufacture which produced two results—displacement of labour and a change in the character of the work of some of those remaining. Machines have been introduced to perform the operations previously performed by boys and girls. Moreover, the tinning machines now employed have displaced the "washman," whose work in the old process demanded considerable dexterity and skill, and reduced the skill required of the tinman.

It is possible that other changes—or, more correctly, a reorganisation of the work of the men still employed—will result in a further simplification of the tinman's task, and the employment of one workman of much experience and skill to perform a small but difficult part of the work of each of a number of tinmen. Consequently, those labour problems created by changes resulting from the introduction of machinery have been confined to the tinhouse. This department presents a very different appearance to-day from that of thirty years ago; but the difference in the mills is scarcely perceptible.

The changes in the methods of production may be seen by comparing quotations from writers at different periods who described the processes in operation at the time of

writing. In Ure's "Dictionary of Arts, Manufactures and Mines" (1875) the following account is given of the method employed before the Morewood patent was generally adopted.

"The tinman's pan is full of melted grease. in this the plates are immersed and left there until all aqueous moisture upon them is evaporated, and they are completely covered with the grease; from this they are taken to the tinpot, and there plunged into a bath of melted tin, which is covered with grease, but as in the first dipping the alloy is imperfect and the surface not uniformly covered, the plates are removed to the dipping or washpots; this contains a bath of melted tin covered with grease and is divided into compartments. In the larger compartment the plates are plunged, and left sufficiently long to make the alloy complete, and to separate any superfluous tin which may have adhered to the surface the workman takes the plate and places it on the table and wipes it on both sides with a brush of hemp, then to take away the marks of the brush and give a polish to the plate, he dips it in the second compartment of the washing pot. The last always contains the purest tin, and as it becomes alloyed with the iron, it is removed on to the first compartment, and after to the tinpot. The plate is now removed to the grease pot; this is filled with melted grease, and requires very skilful management as to the temperature it is to be kept at. The true object is to allow any superfluous tin to run off, and to prevent the alloy on the surface of the iron plate cooling quicker than the iron. If this were neglected, the face of the plate would be cracked. The plate is removed to the cold pot; this is filled with tallow heated to a comparatively low temperature. The use of the grease pots is the process adopted in practice for annealing the alloyed plates. The list pot is used for the purpose of removing a small wire of tin, which adheres to the lower edge of the plate in all the foregoing processes. It is a small cast-iron bath, kept at a sufficiently high temperature and covered with tin about $\frac{1}{2}$ of an inch deep. In this the edge of the plates are dipped, and left until the wire of tin is melted, and then detached by a quick blow on the plate with a stick. The plates are now carefully cleaned with bran, to free them from grease "¹

Not only was this an extravagant and wasteful process, but it produced an unsatisfactory result from the point of view of quality, for it was practically impossible to cover

¹ The grease pot was invented by a Staffordshire manufacturer, Moseley, in 1745 (Edwards).

the surface of the plates with a layer of tin of uniform thickness. This defect was removed by the introduction of the Morewood patent. Mr. Hammond describes the improved process and its subsequent modifications as follows :—

" In former times this process was performed by soaking the plates in a molten metal, and afterwards arranging them on edge in a rack fixed in a grease pot to allow the surplus tin to drain off them, the thickness of the coating being determined, to some extent, by the length of time the plates remained in the hot grease. The process was very wasteful, and it was impossible by its means to obtain a uniform coating over the surface of the plates. About the year 1860 Mr. Hammond Morewood of Llanelli and Mr. John Saunders of Cookley invented machines with rolls placed in the grease pot,¹ to better regulate the quantity of metal, whereby an immense saving was obtained, and a superior and more evenly coated plate was produced. This method, with modifications in detail, continues to the present day.

" In the process as introduced by Mr. Morewood, the wet plates from the swilling-troughs of the white pickling machine were immersed, sheet by sheet, by the tinman, twenty-five to thirty at a time in a bath of melted palm-oil to absorb the moisture on the surface of the plates, and then removed and dipped into a series of pots containing molten tin at various temperatures; and after being brushed, one at a time, on both surfaces by the washman with a hempen brush, they were conveyed by him to the grease pot in which the rolls revolved. The plates on issuing from the rolls in a vertical direction, were raised by a boy and placed in a rack, from which girls removed them to dip in bran, for the purpose of removing grease adhering to the surface. They were afterwards polished by slightly rubbing with a duster of sheepskin or other soft material, by which the coating operation was completed. . . .

" For years past attempts have been made to economise on this method, and to employ chloride of zinc as a tinning flux in substitution for palm-oil in the first pot, but the results for some time were not satisfactory, and large parcels of plates coated by the experimental processes arrived at their destination in a rusty condition, owing, doubtless, to the presence of free acid in the flux, and the porous nature of the iron coated;

¹ Mr Thomas states that the new patent was introduced in 1866. The apparent discrepancy is probably explained by the fact that a considerable period elapsed before the patented process was perfected and made ready for adoption.

the workmen also strongly opposed the innovation, and found means to prejudice buyers and consumers against accepting delivery of any plates prepared by such methods, as injurious to the food products which would be packed in them, and it was not until steel came into general use, assisted, doubtless, by the more careful preparation of the flux, that any degree of success was attained in this direction.

"It is now in general use, and by its means the operation of coating is much more rapidly effected and a brighter finished plate is produced; it has also been proved beyond the possibility of doubt that the material so used is innocuous to the fish, fruit, and other goods for the packing of which the plates are employed."¹

The use of flux made possible the introduction of mechanical tinning-pots, which rendered the washman unnecessary. Mr Hammond describes one class of machine—which differs only in detail from others—as follows. The principle employed is "that of drawing or pulling the plates by means of a nipping appliance working beneath the surface of the metal, through the flux into the tin in a vertical direction, so as to allow the plate to clear itself of any scruff adhering to it. The plates enter and leave the pot perfectly flat, and a coating of any quality may be produced, this being regulated by the speed of the rolls in the grease box and by the quantity of tin in the troughs under the finishing rolls, which also tends to wash off any scruff taken up in the tinpot. The machine is simple in construction and is made of various dimensions to suit the sizes of plates to be dealt with. It is specially adapted also for thin plates or taggers, the thinnest of which can be coated by it."²

At nearly all the machines a tinman and a boy alone are employed; the quantity of palm-oil is reduced, hemp for brushes is saved and "a brighter plate is produced." In some tinning machines even the boy "riser" has become unnecessary; the plate, in its upward course out of the pot, is automatically gripped by a mechanical appliance known as the "iron-man," and placed upon a rack.

The plates on leaving the tinpot are greasy from passing through the palm-oil. This greasy coating is removed by passing the plate through "a mixture of the absorbent nature of meal or flour, such as 'shudes,' a

¹ Hammond, p 9.

² Hammond, p 11

by-product of grain mills, or 'pink meal,' a powdered stone."¹

Here again hand labour has surrendered to a mechanical appliance. The plates are now rubbed to remove a thin layer of dust which remains after immersion in the bran or meal. This work, which was done by girls until about twenty years ago—and still is, in the case of plates of certain high qualities—is now performed by a machine, consisting of a "series of pairs of wooden rolls, mounted on iron spindles, and covered with sheepskin. Alternate pairs are run at a slower speed and act as carriers and holders, the intermediate pairs running against the plate at a higher speed, but in the same direction, to brush the surface."²

The process of manufacture is now complete. The finished plates are conveyed to the assorting room, where they are assorted,³ counted and weighed. They are then packed in elm boxes and deposited in the warehouse.

In the tinhouse highly skilled workers are employed as tinmen, while a considerable number of boys and girls attend to the cleaning process. Assorters in this country are generally men of middle age who have been employed in the tinhouse. What strikes many visitors to tinplate factories most of all is the rapidity with which these keen-sighted operatives are able to run through a pile of plates, and detect flaws in the defective ones.

¹ Thomas.

² *Ibid.*

³ The defective plates being sold at lower prices as "wasters."

CHAPTER III

THE PERIOD OF MONOPOLY, 1865-1887

(a) ECONOMIC CHARACTERISTICS, 1865-1875

THE modern history of the tinplate industry may be said to commence about 1870, partly because the lines of development and the areas best suited to the manufacture had become clearly defined; partly because the methods of production had become fairly stereotyped, and remained for long afterwards but little changed; partly because trade had grown to greater dimensions, thus necessitating a more efficient organisation of the commercial side; but mainly because workmen and masters had become conscious of their existence, and of the growth of problems regarding their relations to one another and to the outside world: in short, the nation had awakened to the fact of the existence of the industry within its boundaries.

The development of the industry since 1870 may be examined in three stages. During the first, which ended in 1891, British manufacturers enjoyed a complete monopoly of nearly all foreign markets. Moreover, demand grew so steadily that only on those occasions on which over-investment of capital had been made was there any real competition between home producers. Nevertheless, this period is not without interest. The substitution of steel for iron had many important consequences; attempts were made by manufacturers to limit output by concerted action; two disputes occurred between the employers and workmen which rank among the most important of the period.

The second stage ended with the close of the 19th

century. The McKinley Tariff Act of 1890 made inevitable the establishment of a competing industry in the United States; and for several years the Welsh trade suffered from a depression which was probably as intense, relatively to the size of the industry, as any experienced in this country. Consequently this has been called the period of competition. The last stage, which brings us to the present day, is that of trade recovery. The industry to-day is larger than it ever was, although not so large as it would have been if the American market had been retained.

During most of the first period, *i.e.*, the period of monopoly, iron-bar and tinplate manufacture constituted practically one industry. The trade union included workmen engaged in both stages of production, and the masters' association was similarly comprehensive. The former association was completely ignored by the latter. During the second period, although in some cases the two stages were under common control, the steel and tinplate industries were quite separate. The merchant acted as an intermediary between the producer of the semi-manufactured steel and the maker of the finished product. Tinplate workmen alone were eligible for membership of the trade union, while the masters' association was confined to the one industry. At this period the union proved strong enough to demand and enforce recognition from the latter, but the relations of the two were anything but cordial. To-day the steel and tinplate industries have been brought under common financial control, although the masters' association is still confined to the tinplate industry, and the Conciliation Board determines the conditions of employment in that industry alone. The unions are heterogeneous in composition. One includes tinplate and steel workmen, another is confined to those engaged in tinplate factories, the remainder include men employed in a number of other industries. The relations between the associations of the masters and men are normally of the most happy description.

Thus there seems at first sight to be a close connection

between the presence or absence of competition and the organisation of the two industries. But the following chapters will show that such a view is false. For the changes in organisation in the second period were the result of the substitution of steel for iron. It is simply a coincidence that the change in the raw material occurred near the end of the period of monopoly. Again, recent changes are due partly to foreign competition in steel and partly to other causes which call for detailed examination in other chapters.

Since the rest of this monograph is to be mainly concerned with modern history, it may be well to indicate briefly the main features of the trade during the decade 1865-74. (1) The first seven years comprised a period of rapid expansion, and exports increased from 1,254,000 cwts. in 1865 to 2,392,000 cwts. in 1871. Then the rate of growth diminished, and in 1875 exports had increased only to 2,767,000 cwts. The number of factories erected during the same period does not accurately reflect the growth of trade. In 1865 there were 47 in existence; in 1870, 59; in 1875, 75; that is, the increase in the number of factories was greater during the period of slow growth than in the earlier period of rapid expansion. The explanation is simple. A tinplate factory contains a number of mills; and the producing capacity of some of the existing factories was increased by the addition of new mills, while the new ones contained more mills than most of the older ones. Thus there was a marked tendency during these years towards production on a larger scale. For purposes of comparison statistics of mills are more useful than those relating to factories;¹ but these are unobtainable. The rapid expansion of the industry during this period was mainly due to the growth of the American market.

(2) Liverpool was at this time the chief exporting centre. Tinplates were sent coastwise from South Wales,

¹ When comparing long periods, or short periods separated by long intervals, even the number of mills is not a safe guide, since changes occur in the possible or customary daily output of the mill.

and re-shipped at the Mersey port to foreign countries. The main advantage of Liverpool lay in the fact that there already existed lines of communication with the ports of destination. But in 1882 the Prince of Wales dock, equipped with modern appliances, was opened at Swansea, and soon the southern port grew at the expense of the northern. For the growth of demand made it possible to maintain a direct shipping trade with the chief importing centres. Five years later the Swansea Metal Exchange was opened. During the period when Liverpool was the chief distributing centre it was also the home of merchants; but by the end of the eighties it had taken second place, and most commercial transactions were conducted at Swansea, where practically all the important London and Liverpool metal merchants had opened offices or were represented by agents.

(3) Statistics of prices are sometimes as instructive to the serious student as they are uninteresting to the general reader.

Year 1865-1874	Average Selling Price ¹ of Tinplate per box, f o b , Swansea
	£ s. d.
1865	1 2 5
1866	1 5 0
1867	1 3 6
1868	1 1 10
1869	1 2 9
1870	1 1 8
1871	1 3 0
1872	1 14 1
1873	1 12 8
1874	1 9 1

Compared with those for more recent years (*e.g.*, 1880, about 19s.; 1885, 14s.; 1890, 14s. 4d.; 1905, 11s. 11d.) the average prices indicated in the above table are exceedingly high. From 1873 there was a marked tendency downwards. At first this was partly due to a fall in general prices, and especially in the price of block-tin, but since

¹ Thomas.

the downward tendency continued until 1887 (checked only during the boom of 1879), in spite of a slight upward tendency in the price of tin, the explanation must be sought elsewhere. More economical production (made possible by the Morewood tinning-pot and machinery in the pickling department), together with repeated over-investment of capital, are probably the main causes of the reduction for the first ten years or so. Subsequently the substitution of steel for iron led to a further reduction in cost.¹

(4) The method of determining prices during this period suggests that competition was by no means keen. Quarterly meetings of manufacturers and merchants were held, at each of which prices were fixed for the ensuing three months. We read, for example, that at the first quarterly meeting of the year 1869 "it was resolved to advance the price of tinplates 3s. per box."²

(5) The demand for tinplate in those days was probably extremely inelastic, i.e., appreciable changes in prices did not affect sales to any great extent.³ Between fairly wide limits of price consumers continued to buy. Prices were very high in comparison with those now ruling, and only those customers purchased plates who could not well do without them. It is a truism that demand may be inelastic about one price and elastic about another. In more recent years, when tinplates became cheaper, new uses were found for them; but they were often preferred to competing commodities (such as wooden tea-chests) on account of their cheapness rather than of their intrinsic superiority. A rise in prices would therefore remove the ground of preference and naturally induce the buyers to revert to the articles formerly in use, or to search for other

¹ *Vide Report "Depression of Trade," 1885, September*

² "Engineering," January 15th. The increase was made possible by the fact that while stocks were only sufficient to meet ordinary demand, a brisk demand from U.S.A. was expected

³ We are now referring to long period demand, determined by the real needs of the customers. It is true that buying merchants and consumers, in their desire to purchase as cheaply as possible, buy largely when prices are lowest on a fluctuating market, but this is a different question.

substitutes. At this time, however, the consumers in most cases had no alternative; and when one realises that the cost of tinplates forms but a small proportion of the total cost of the goods which they assist in making, it will be evident that in those early days wide variations in price were possible without much resultant change in demand. Consequently enormous profits prevailed until they led, again and again, to over-investment of capital.

(6) The industry was becoming more and more strongly localised. Of the thirty-five factories in existence in 1850, twenty-two were in Glamorgan, Carmarthenshire, and Monmouthshire. By 1875 forty-two more had been erected, of which thirty-five were in those counties. Staffordshire, Worcestershire, and Gloucestershire, which together constituted an area of some importance sixty years ago, made little or no progress later. Thus it was during this period that the industry became essentially Welsh.

(7) Glamorgan and Carmarthenshire had become important centres of the industry. In each county there existed an independent association of masters, and these were amalgamated in 1874 to form the Carmarthenshire and Glamorgan Tinplate Makers' Association. Apart from this association, which was expressly limited to deal with the conditions of employment, periodic meetings of manufacturers were held for the discussion of questions of general trade policy; e.g., "Engineering," September 13, 1872, contains a report of a meeting called to determine the policy of the employers in face of the existing over-production and threatened reduction of prices.¹

(8) Wages at this time were largely determined by custom. In 1871 the first labour association of which we

¹ It was decided to reduce the output by one-third until the market had recovered; and the method adopted was to close each factory two days per week. The fear of a reduction of prices suggests (and other evidence proves) that the price agreement already referred to was not generally observed. It is also evident that since the customary output in a normal week was considerably below the producing capacity of a well-equipped mill, the total production during the four working days under the above agreement would not be much less than the customary output for a full week.

have record was formed. The demand for labour was increasing rapidly and continuously; probably it was more difficult for an employer to find skilled workmen than for a workman to find employment. Considerable variations existed in the wages paid in different localities, but on the whole piece rates were in some places slightly higher, and in other places slightly lower than those paid under the wage agreement of 1874.¹ Wages were usually paid monthly, but at the end of a fortnight—sometimes every week—a workman so desiring was paid a sum of money known as “assistance.” A system not unlike “truck” existed in some places. The workmen employed at certain iron and tinplate works were “expected” to purchase goods at shops owned by the manufacturing firms or members of those firms. But there is no evidence to suggest that the evils commonly associated with the truck system appeared. Wage contracts usually covered a period of four weeks, so that a month’s notice on either side was necessary to terminate an agreement between master and workman. Monthly contracts have remained to this day the universal method of engagement.

The actual weekly earnings of the period are not obtainable in published statistics. “Miscellaneous Statistics of the United Kingdom” (Part III) for 1861 gives the wages of “Tinplate Workers” for that year as 24s. per week, or £62 8s. for the year. But the term “Tinplate Worker” as used in early government publications is confusing. Occasionally it means the tinplate maker (*i.e.*, the operative in the tinplate factory), but more frequently it seems to indicate the artisan who converts the tinplate into biscuit boxes, etc. In this case the former seems to be referred to. The wages census of 1885 gives the average wage of employees in tinplate factories as (*a*) £55 5s. per annum—obtained by dividing total wages paid in 1885 by the number employed on October 1, 1886: (*b*) £58 5s.—obtained by multiplying the average rate of a normal week by fifty-two. A comparison of the wages for 1861 with the second of the estimates for 1886 suggests

¹ See pp 30-39

that in the interval average wages fell £4 3s. per annum. But such an inference cannot, for more than one reason, be drawn. In the first place, although piece rates were in some cases slightly lower after 1874 than before a uniform rate was fixed, the rate of output had increased from twenty-five boxes (normally) to thirty-two and thirty-six boxes per shift; and since piece rates were (and still are) paid in most branches of skilled work, weekly earnings should obviously show an increase. Again, it is possible, though not probable, that workers in iron forges attached to tinplate works were included in preparing the estimate for 1861. Finally, the phrase "average rate," when applied to an industry, conveys no meaning. In the tinplate industry both women and boys are employed, so that their wages affect the average. The actual wages paid to each group may be increased while the average rate shows a fall (if the proportion of women and boys is increased), or they may be reduced while the average rate indicates a rise (if the proportion of skilled workmen is increased). The phrase "average wage" for the country as a whole has long been discarded, but it is still sometimes used for an industry. But even here it conveys nothing. Two occupations within an industry may be as unlike each other as two in different industries—*e.g.*, there is little if any mobility of labour between the rolling mills and the tinhause: there is none between the pickling department and the office.

(9) The machinery employed in the rolling mills was practically identical with that now utilised. In 1866 the Morewood tinning-pot, one of the greatest inventions in the history of the trade, was introduced into the tinhause, and soon was being generally used. Again, after 1874 machinery was gradually substituted for some forms of hand labour in the pickling department. In short, by the end of the decade the essential features of the modern tinplate factory had been evolved. Since then there have been new inventions and improvements upon old methods; but in nearly all cases these have involved alterations in detail rather than changes of a revolutionary character.

It is true that in quite recent years electricity has taken the place of steam as the generator of power in a few factories,¹ just as at the beginning of the period under review steam was being introduced in place of water power. It is also true that these changes are revolutionary in character. But they are not peculiar to this one industry. In the steel industry, on the other hand, rapid progress has been made during the last few years, and fundamental changes have been introduced in the method of production; e.g., electric chargers have been invented to feed the furnaces, while the rolling mills have been revolutionised. In both cases there has been considerable displacement of hand labour and a demand created for a different kind of skill. Such, however, is not the case in tinplate manufacture. The method of production is, in its essentials, the same now as it was forty years ago. This fact is of some importance when we come to examine labour problems. The tinplate worker is a highly skilled operative. Some of the tasks which fifty years ago were performed by hand are now performed by machinery; but where hand labour has not been displaced, it continues to call for skilled workmanship. Perhaps the work of a tinman is not now so difficult as it was a generation ago; but no one would suggest that a tinman, even under present simplified conditions, is not a skilled workman. The introduction of new machines has not created a demand for unskilled labour in place of a demand for labour of a high grade. Tinplate workers, generally speaking, are not machine tenders. The rate of output is not determined by the speed of the machinery; the machine cannot be "speeded up" to force the men to work harder; the men control the machines, the machines do not control the men. This fact, too, needs to be borne in mind during the examination of the labour problems which have existed and still exist.

(10) At this time the iron forge and tinplate factory generally existed together. Writing in 1880 a manufacturer stated that "at the larger works it is customary to

¹ But it is still in the experimental stage.

puddle and roll the iron which is used, but smaller works buy the plates ready-made and confine themselves to the process of tinning."¹ Iron bars were then used as raw material: but experiments were being made with steel, and ultimately the latter completely ousted the former. The change from iron to steel brought with it other important results. At first the steel and tinplate industries were separate. Then the former became subsidiary to the latter: it aided the development of the tinplate trade to such an extent that the latter soon became the greatest of the metallurgical group of industries in the neighbourhood. Thus two distinct and separate industries arose, and in time separate labour organisations and masters' associations were formed. Each trade had its own special problems. In recent years, however, there had been a distinct change—*a rapprochement*—and few tinplate manufacturers exist to-day who have no financial interest in steel factories. This question is more fully dealt with in the seventh chapter. But it may be stated at this point that the separation of steel and tinplate, the later partial amalgamation, the creation of separate unions and their subsequent limited federation, form one of the most interesting chapters of modern industrial history.

(11) Cornwall had from the earliest times been the chief source of supplies of tin, but during this decade—to be exact, between 1870 and 1875—the Malay Straits took the lead. The importance of Cornwall slowly diminished after 1870, and while the Malay Straits supplied rather more than half during the first decade of the 20th century, Banca and Billiton and Bolivia became increasingly important and together supplied roughly a quarter of the total quantity used in this country. Cornwall now provides only about 5 per cent. of the total supply, and practically none of the tin used in tinplate manufacture.

The history of the tinplate industry since 1870 is largely a record of the changes indicated above, together with an account of the expansion of trade, the loss of the major portion of the American market, the activities of the

¹ Edwards

820

338·476696

NIA.

masters' associations, the organisation of labour, the disputes between employers and workmen, the determination of the wages rate and the general condition of labour, and the attitude of the labour associations towards such questions as the regulation of output and the introduction of new machinery. Perhaps the most interesting of all to the economist is the evolution of the present method of collective bargaining. These will form the subject matter of most of the chapters which follow.

(b) THE WAGES DISPUTE OF 1874

The first event worth recording after the formation of the Workmen's Union in 1871 was the wages dispute of 1874, which resulted in a lock-out extending over nearly half a year, and in the establishment of a standard wages rate for the industry in the area affected. The stranger to South Wales will be better able to follow this and other events narrated in the present chapter if a few facts of commercial and physical geography relevant to the subject are first placed before him. The ports from which tin-plates manufactured in the south are shipped, are situated on the Bristol Channel. They fall into two groups, the western, comprising Llanelli, Swansea (the chief), Neath, and Port Talbot; and the eastern, consisting of Cardiff, Newport (the chief), and Bristol. Naturally, each port was supplied by the factories in the districts around it in so far as there existed convenient lines of ships to the ports of destination, or if, as was generally the case during the period which we are now examining, the plates were sent coastwise to Liverpool for re-shipment abroad.

The western tinplate district extends from Kidwelly in Carmarthenshire to Port Talbot in West Glamorgan, a distance of about thirty miles. In the days in which water power was utilised, nearly all the factories were built on the banks of streams entering the channel between these villages; and factories erected since steam power was introduced have been built within the same area. The

works near Llantrissant (ten miles west of Cardiff) is the most westerly of the eastern group, which includes a large number in Monmouthshire, one at Treforest, near Pontypridd, and one (Melyngriffith) on the outskirts of Cardiff.¹ Although these are more widely scattered than the factories in the west, the two areas are similar in many respects. They consist mainly of hilly country, intersected by numerous deep, narrow valleys, partly industrial and partly agricultural. They are separated by a tract of low-lying country extending roughly from Port Talbot to Llantrissant, a distance of about twenty-three miles. This plain, which is bounded on the south by the channel, and on the north by the Mid-Glamorgan coal-field and the Rhondda hills, is almost entirely agricultural. During the period under discussion Staffordshire, too, was a county of some importance in tinplate manufacture. It was about as large a centre as Carmarthenshire, but while the latter flourished and has continued to grow up to the present, Staffordshire declined, especially after the introduction of steel in the early eighties.

The wages dispute of 1874 was confined to the western district, *i.e.*, to Carmarthenshire and West Glamorgan. There existed at that time two associations, one confined to the manufacturers of Carmarthenshire, the other restricted to the employers of West Glamorgan. The workmen's union, too, which had now been in existence nearly three years, embraced only those employed in the factories of the western district. There were thus two masters' associations and one labour union in that district, while both employers and workmen in the east were unorganised.

The conditions of labour in the west were anything but uniform. In some cases millmen worked twelve hours a day, in others eight. The prevailing rates of wages varied widely in the different factories, but, generally speaking, little change had been made for several years, and in most cases they were lower than those paid in Monmouthshire and Staffordshire. Even where the hours of labour had been reduced from twelve to eight per day

¹ Statistics are given elsewhere

without some increase in piece rates, the weekly earnings of the men had diminished only in those few cases in which the reduction of hours had not been accompanied by a corresponding increase in the efficiency of labour. In spite of the complaints of the workmen at this time, it is probably true to say that in the vast majority of cases the quantity produced by a unit group of workmen under the old conditions was not greater than that produced by a corresponding group in the shorter day. For the daily output per mill had for many years been limited by custom to an amount far below producing capacity. In the fifties it appears to have been twenty and twenty-five boxes per shift, but by this year it had increased to thirty; and the lack of evidence to the contrary, together with the implications of the controversies of the time, suggest that the introduction of the eight hours day was not followed by a reduction in the output. Even at this time complaints were common that in some places, where the workmen were granted a bonus on the excess beyond that limit, the customary output of thirty boxes was exceeded. Nevertheless, the workmen complained that they were not so well off as they had been in the past. Moreover, during the boom in the early seventies, the general level of prices had risen, and consequently the real wages of labour had fallen: the purchasing power of the sovereign had diminished. Several attempts had been made at individual factories to obtain higher piece rates, but although in some cases they had ended happily for the men, in the majority of cases they had proved unsuccessful. Early in 1874, however, the union made a determined effort to secure a general increase in wages and a uniform scale for the whole district. A demand was made for the rates paid in Staffordshire and Monmouthshire: the rates paid in those districts were used as a lever to raise those prevailing in the west, just as twenty years afterwards some manufacturers employed the scale paid in a few of the factories as a lever to secure a general reduction of wages. Subsequent events proved that the employers were not averse to a standard rate. Such a rate would enable them

to undertake long contracts with greater confidence. Further, by preventing the intensification of competition during a period of temporary depression, and by preventing under-selling on the part of those who succeeded in reducing wages, it would enable manufacturers to control prices more easily. A standard rate provided security and eliminated one element in competition.¹ But the manufacturers objected to an increase in wages at this time. The boom was at an end. Prices were falling, profits were diminishing, and the margin allowing a rise was said to have disappeared. The demand for higher rates had been made at an inopportune moment. It was a period, not of general decrease of trade, but of over-production resulting from over-investment of capital in the industry. Moreover, the employers objected to a scale determined by the rates paid in the east. In the first place the eastern factories, which were more or less isolated, produced rather less than one-eighth of the total supply; and it was not appropriate that the rates paid in a comparatively small isolated group of factories should determine the scale for the industry as a whole. Furthermore, the employers in the border and midland counties experienced difficulty in obtaining a sufficient supply of labour, and were compelled to offer higher rates to attract the right kind of workman to the trade or to the place. Finally, the operatives in the east worked with less efficient machinery, and the average daily output was less than in the west; consequently, the difference in the piece rates did not indicate the difference in weekly earnings. The employers engaged in the dispute contended that although the rates paid by them might in many cases be lower, their workmen were, on the whole, quite as well off as those employed in the other districts. This, then, was the general position.

At the beginning of 1874, if not earlier, there were signs of unrest, and a committee composed of seven employers

¹ An admirable statement of the advantages to the employer of a uniform rate of wages is to be found in "Industrial Democracy," by Mr. and Mrs. Sydney Webb

of Carmarthenshire and seven representatives of the workmen met to discuss the situation. But in February, before an agreement could be concluded, the men employed at Kidwelly, where the dispute began, submitted a request for a general increase in wages of a halfpenny per box, this being the difference between the rates actually paid and those prevailing in the east. This was followed within a few days by demands from men employed elsewhere in the district. The Carmarthenshire employers replied by posting notices terminating contracts, and almost simultaneously the employers of West Glamorgan, to whom similar requests of the same nature had been made, did likewise. The position from the masters' point of view was unsatisfactory. The demands of the men varied from place to place where they had been formulated, while in some cases they had not taken definite shape. A general notice was regarded as necessary to clear the air. When the struggle began the two employers' associations were separate and acted independently, but on March 23rd they amalgamated to form the Carmarthenshire and Glamorgan Tinplate Makers' Association. This association controlled thirty-one works out of thirty-five in the district. The resolutions of the separate bodies were dealt with as notices given by the combined association; and all tinplate manufacturers, associated and non-associated, were requested to assist in the dispute by refusing to employ discharged men within three months. The amalgamation strengthened the position of the employers of Carmarthenshire. A general stoppage was regarded as desirable for the purpose of reducing stocks and enabling the market to recover. But a stoppage confined to Carmarthenshire might prove ruinous to the local manufacturers: sectional action, by compelling customers to buy from rival firms, might result in permanent loss of the market. On March 21st the notices at Kidwelly and Brynamman expired, and within a week five factories were idle. In a very short time the lock-out became general.

On March 21st a conference of Glamorgan workmen was held, attended by delegates from Carmarthenshire.

While it was decided at the conference to press the claim for higher wages, a resolution in favour of arbitration was passed. The employers were equally favourable to such a policy, but no agreement could be arrived at upon the question to be submitted. The men contended that the basis of arbitration should be "whether the wage rate is to remain as at present or whether it should be raised to the same rate as in England, or to what extent." The masters, on the other hand, would only consent to arbitration on condition that the men bound themselves to accept the award even if it involved a reduction in rates.

Arbitration, however, was scarcely the best way out of the difficulty. Assuming that the arbitrator succeeded in making an award satisfactory to the men's leaders, there was no guarantee that the latter would be able to enforce it—the first condition of success was absent. The union numbered but 4,000 men out of at least 20,000 said to be affected by the lock-out;¹ and the subsequent history of the dispute clearly shows that the leaders had little real influence over the general body of workers—a few weeks later, indeed, the latter completely ignored the executive of the union. But it was extremely unlikely that the arbitrator would be able to satisfy both the masters and the leaders of the men. The desirability of a uniform wage was not disputed, but it was scarcely likely that an outside body could fix a scale that would be satisfactory to all concerned. If the wages paid by a representative firm in the western district were allowed to determine the general rate, the men would never consent to the award. If, on the other hand, eastern rates were adopted as the standard, the masters would seek the first opportunity to revise the scale in their favour. Lasting peace could not be expected from arbitration.

The workmen were obviously unprepared for a long struggle against their employers. The union was numerically weak and lacking in funds. Apparently the normal individual contribution at this time was 7d. per month, although for some weeks before the lock-out it had been

¹ "Cambrian," March 27th.

raised to a shilling; consequently the men relied largely upon outside contributions. These were not forthcoming to anything like the extent anticipated. Although promises of support were made by their fellow-workmen of Monmouthshire at a meeting of delegates on April 25th, little assistance was received from that quarter. By May 4th the union funds were completely exhausted and the men depended entirely upon subscriptions, proceeds of concerts, and monies obtained from other outside sources.

Realising that they were playing a losing game, the executive of the men's union decided (on April 24th) to offer to withdraw their claims upon certain conditions. Their first demand had been for an increase in wages from the previous first of January: they now withdrew this and asked for a Conciliation Board to discuss a revised list of wages. The masters' association declined to meet any deputation until the original demand had been unconditionally withdrawn. They argued that to express "a desire to meet the masters with a view to a settlement of the wages rate" was "inconsistent with an unconditional withdrawal." The masters, in short, declined to meet the men's representatives "to adjust the rate of wages on the basis of any advance." On May 4th the last of the notices expired, and thirty-one factories,¹ employing (it was said) about 20,000 hands, were closed. Three days afterwards the union executive passed the following resolution: "That we are prepared to withdraw our present demand unconditionally and that intimation to this effect be forwarded to the masters that they will meet us with a view to a settlement of the wage rate." In reply to this the masters' executive, on May 18th, resolved that all employers be allowed to open their works subject to the consent of the workmen to sign the rules governing such works—in other words, permission was given to individual employers to re-commence work provided their men had withdrawn their claims. But the strike was not yet at an end. A week later a meeting of the general public was held at

¹ Iron and tinplate factories

Llanelli, and a few days afterwards another at Swansea, and deputations were appointed to intervene in the dispute. The masters were interviewed on June 9th, but without result. The workmen soon afterwards ignored the union and took matters into their own hands. General meetings of the men employed were held at several factories, and resolutions were passed in favour of resuming work on the old terms. The employers' association, on June 29th, granted permission to the members to re-open for a month from July 6th; and on the latter date the lock-out may be said to have terminated. At the end of the month the permission was renewed and trade resumed its normal course. For the next few months the masters' association was occupied in preparing a scale of wages for adoption in the western district. This was finally agreed to on November 24th, and came into operation on January 4, 1875. Although the conditions of manufacture have considerably altered since then, the 1874 list remains to this day the standard measure of changes in wages. All subsequent modifications were simply adaptations of the standard rates of 1874 to new conditions.

The ground of the workmen's complaint—"that higher rates are paid for the same class of work in one district than in another"—was removed, and the new scale seems to have been cheerfully accepted by the majority. It is true that some of those who suffered reductions were dissatisfied and made representations to the employers through their leaders; but they were too weak to fight, while the union and its officials were ignored by the employers' association. The latter, indeed, refused to recognise the men's union at any stage of its existence. More than once during the period covered by this chapter the workmen's leaders endeavoured to establish a board of conciliation and to obtain recognition for the union, but every attempt was unsuccessful. Recognition was not enjoyed until 1889, when new and strong associations had been established by both masters and workmen.

The constant reference to the "1874 list" by the workmen's union has led many to assume that the dispute

ended in a victory for the men ; but sufficient evidence has already been adduced to prove the contrary. A two-fold claim was presented by the men : in the first place they wanted a scale, and in the second place they demanded a scale determined by eastern rates. Their first request was granted : uniformity was enjoyed from 1875. But the fact that the masters' association, without interference from the men or their representatives, and after having compelled a return to work upon the old terms, sat twenty-one days in committee constructing a list, is sufficient evidence of the desire of the employers to establish a standard rate. The dispute provided an occasion of which employers took advantage, and for which many of them were thankful. The second request of the men was not granted : eastern rates were not conceded. On the contrary, in view of the fact that representative rates in the western district seem to have been the basis of the scale, it seems probable that a uniform rate involved a reduction of wages for certain classes of work in some of the factories.

It is perhaps idle to speculate upon the probable result if the men had chosen a better time for presenting their claims. They fought during a period of depression resulting from over-production. The producing capacity had been increased too rapidly, the spring orders from America had been disappointing, and in spite of the stoppage prices continued to fall for some time. Three years previously prices were high, enormous profits were enjoyed, skilled labourers were scarce, and a splendid chance presented itself to the men. A union was formed, but united action could not be taken at once. As soon as the leaders believed the men to be sufficiently well organised they determined upon a general fight, irrespective of the prevailing market conditions. The workmen undoubtedly suffered from the inexperience of their leaders. The latter were pioneers and were well fitted to perform the difficult task of creating a spirit of association. But in their negotiations with employers they worked under great disadvantages. They were leaders of a weak

organisation whose very existence depended more upon the force of their own personality than upon any other factor. And it is eloquent testimony to the work they were able to do, and the influence they were able to exercise, that such a union remained in existence so long. But in 1874 they had had little experience, while they were scarcely fitted by temperament to conduct negotiations with the employers, and to do other work calling for conciliatory power of a high degree. They failed to follow the movements of trade with sufficient closeness; and when on the platform they were often guilty of exaggeration, and were responsible for widening rather than closing the breach which had occurred at this time between masters and men. The names of Jenkyn Thomas, the president, and William Lewis (Lewys Afan), the secretary of the union, the pioneers and for many years the leaders of unionism in the industry, should be recorded in the rule-books of all the associations now existing in the trade.

(c) 1875-1883

The history of the trade during the next fourteen years presents curious features. Exports increased steadily, and in one year only (1876) did they suggest a check in progress. In some years (*e.g.*, the boom year 1879, during which 101 new mills were erected) the increase was quite remarkable. Nor is there any reason to suppose that at any time during this period the amount required for home consumption diminished. Although statistics of production are unobtainable, it is well known that the trade was almost entirely with foreign countries, mainly the United States. Consequently the total loss of the home market would not have affected demand very considerably. But it is highly probable that the total demand for tinplate increased with the growth of the export trade, and that the trade from this point of view was throughout as prosperous as could reasonably be hoped for, even in the case of an industry enjoying a monopoly of nearly all foreign markets. Nevertheless, during these years the

trade suffered from periods of depression and low prices :¹ a considerable increase in the foreign demand was accompanied by prices which were unremunerative to many of the manufacturers, a number of whom failed. In every instance the depression was due to the fact that the producing capacity increased even more rapidly than demand.

The following statistics, drawn from various sources, do not at first sight bear out the above statement :—

Year	Factories	Mills ²	Total employed	Exports (tons)
1851	—	—	5,200	—
1858	—	109	—	—
1860	40	—	—	—
1861	—	—	5,700	—
1865	47	—	—	62,718
1868	—	171	—	88,406
1870	59	—	—	98,851
1871	—	—	9,200	.. 119,606
1875	75	—	—	138,363
1878	—	218	—	155,240
1880	—	369	—	217,718
1881	—	389	15,500	243,381
1885	96	—	—	298,386
1886	73 ³	—	—	334,692

These tables show that exports increased more rapidly than the number of factories, mills or men ; nevertheless, the producing capacity increased more rapidly than exports, and undoubtedly faster than the demand. This clearly proves what has already been indicated, viz., that comparisons of men employed, factories at work, or mills in operation, are unsatisfactory when made for long periods. The apparent contradiction in the above figures is easily explained. In the first place the number of shifts worked in twenty-four hours increased during this period from two to three. One complaint of the men during the 1874 dispute was of the lack of uniformity in the conditions of employment. At some factories a shift was of twelve hours' duration : at others eight. By the end of

¹ "Depression" is scarcely the right word, since it implies decline in trade, but it indicates with sufficient exactness the meaning which it is intended to convey.

² E Trubshaw, "Journal of Iron and Steel Institute," 1883, I

³ In operation in July.

this period (1887) the eight hours' day had been generally adopted, and three shifts had been substituted for two. But this alone does not afford the explanation. In the meantime, however, the productiveness of the mills had increased. The new mills which were erected when the machinery referred to in the previous chapter had been introduced were in every way superior to the old, and the men turned out a larger quantity in eight hours than previously was produced in twelve. The customary output had increased from twenty-five and thirty boxes in the longer day to thirty-six boxes in the shorter day; or in other words, taking thirty boxes to be the normal output in a day of twelve hours in 1865, the productiveness of the typical mill, and consequently the efficiency of the men¹ had increased about 80 per cent. in rather more than two decades.² This clearly explains the depression suffered periodically during a period of expansion of trade and of monopoly of foreign markets.³

It is to be expected that wages questions assumed considerable importance during these alternating periods of prosperity and adversity. The relative depression, which, more than any other factor, had enabled the masters to gain a victory in 1874, continued with little interruption until the latter half of 1879, and several endeavours were made by some employers to persuade the association to reduce the general rate of wages. The first (in 1875) met with no success. The following year, too, the association voted against a general reduction; but shortly afterwards a resolution was passed allowing any employer to pay less than the standard rate to his workmen provided he was able to effect a reduction without assistance from the association.

The earlier policy of the association was quite

¹ The full economic efficiency of a workman is a function not only of his own strength and character but also of the quality of the material and the machinery or plant

² "During that period (thirty years) improvements in plant have doubled the output of a mill" Evidence given September 28, 1885, before the Royal Commission on depression of trade

³ In 1885 there were eighty-four works in Wales, "and more than thirty of them, chiefly of the smaller class, have failed during the last five years," *Ibid.*

intelligible. In the first place a moderate general reduction would have afforded no relief. The labour cost per box was a comparatively small proportion of the total expenses of production, and a considerable reduction of wages would only slightly diminish the total cost. The demand was quite satisfactory, and a small economy resulting from the fall in wages could not be expected to add much to sales. The low prices ruling were due largely to the reluctance of some manufacturers to close down mills which were rapidly becoming obsolete. They worked on a basis of prime cost, and so long as they were able to sell at a price which covered running expenses they continued to produce. By forcing a general reduction the association would merely be extending the period of competition on the part of such makers; but by maintaining the 1874 list they were hastening the process of substitution of modern for old-fashioned mills, and eliminating the competition of those who refused to introduce newer methods involving higher standing charges.

It is difficult, however, to understand the association's later policy of granting permissive powers to the members. Such a policy was obviously prejudicial to the interests of the better class of manufacturers; and these probably formed a majority. It was more harmful than a general reduction of wages would have been, since it intensified, in a way the latter did not, the competition of the owners of antiquated mills. These were probably manufacturers who had not yet introduced the Morewood Tinning-pot into the tinhouse, the recently discovered machinery into the pickling department, and other devices for reducing cost. They would be the most anxious to reduce wages, and naturally they would make use of the powers granted them. Such a policy placed a premium upon inefficiency by lessening the comparative disadvantage of the unenterprising manufacturers. It removed an incentive to progress. That this result followed a differential rate was generally recognised by employers during the depression of the nineties, to which reference will be made in a later chapter.

Meanwhile, the workmen made their first attempt to obtain differential rates. Certain plates known as 28×20 were said to be more difficult to manipulate than those of the standard size, and the union endeavoured to raise the piece rates for this class of plate. But they were far too weak to press their claim, and the attempt ended in failure.

Early in 1877 the association resolved upon a reduction of $7\frac{1}{2}$ per cent. of all wages except those of puddlers, ballers and shinglers. This resolution became effective in March, and was only discontinued in October, 1879, when the market had completely recovered. Three months after the re-establishment of the 1874 list the wages of puddlers, ballers and shinglers were appreciably raised; and the increased rates were continued exactly a year, when the association again determined to reduce them to their former level. But the workmen did not submit without a struggle. The men employed at fifteen works immediately resisted, and these were afterwards joined by the men engaged at five other works; and a strike followed which lasted till June. Four firms refused to press for the reduction, and eventually left the association; so that the owners of sixteen coke forges fought with the assistance of the association. Finally a compromise was arrived at, and the scale, in so far as it referred to the classes indicated above, was slightly modified. In July, 1880, all prices referring to charcoal forges were expunged from the association list of wages; and in August, 1885, those referring to coke forges suffered the same fate, leaving only the mills and tinhouse rates.

The facts briefly stated above indicate two things. In the first place, the depression had become so severe that prices were everywhere unremunerative, and employers welcomed even the relief promised by a general reduction of $7\frac{1}{2}$ per cent. in wages.¹ In the second place, the elimination of charcoal prices was due to the competition

¹ Since the demand for tinplate was highly inelastic between the prices indicated by the costs before and after the fall in wages, the gain to the manufacturers from such a reduction was obviously not of long duration. Equally keen competition followed upon the new basis of a lower cost. The evil of over-production remained

of Siemens steel with charcoal iron. The former was rapidly displacing the latter, and it was evident that the days of charcoal forges were numbered. Many had already been closed, while in the case of the others the evil day could be postponed only by allowing the owners a free hand in the management. To attempt to enforce the old standard rate in the forges under those conditions would be foolish. The same remark applies to the competition of Bessemer steel with coke iron, and the removal of coke prices from the association list. This naturally leads to the examination of an event which marked an epoch in the history of the trade, viz., the substitution of steel for iron as the raw material in the manufacture of tinplate.

(d) INTRODUCTION OF STEEL (1883-1886) AND ITS CONSEQUENCES

The quality of tinplate required depends upon the purpose for which it is employed. Two main classes—"ordinary" and "stamping" plates—were manufactured at this time, and for "stamping" plates it was necessary to produce a quality of iron which would bear folding and stamping. Every sheet was required to stand the test of conversion, but the remaining tests for the two classes were different. "For stamping purposes and for the higher grades of tinsmiths' work every sheet must be a CERTAINTY, or the result becomes positively valueless";¹ and for such ware "the iron must be sufficiently well coated to resist years of hard usage." But for canister and similar work "it is sufficient that the iron should be suitably coated to protect the contents." The superior quality was manufactured from charcoal iron, the "ordinary" grade from puddled iron. No substitute had ever been discovered for iron, and it was believed that the position at least of charcoal forged iron was unassailable. The first experiments with steel were made

¹ Where no indication of their source is given, the quotations in this section are taken from a paper by P. W. Flower "The Origin and Progress of the Manufacture of Tinplates, Journal of the Iron and Steel Institute," 1886, I.

about 1864, when Dowlais bars were tried by Joshua Williams at the Aberdulais tinplate works. "The first intention was to compete with *charcoal iron*, but the attempt had to be abandoned in consequence of apparently capricious variations in the toughness of the sheets. The bars would vary for softness within their own length, the substance of the bars would also vary and hard bars would constantly smash up the old-world machinery which was then in use." Consequently, this attempt ended in failure, and no further progress with Bessemer steel was made until, in 1880, the price of bars fell to such an extent that they could be used with profit as a substitute for *puddled iron*. Three years later basic steel blooms from Middlesborough began to compete with Bessemer bars.

In the meantime experiments were being made at Landore with Siemens steel; and this article ultimately superseded charcoal iron on the ground of cheapness alone. "The introduction of open hearth steel as the foundation for charcoal tinplates dates commercially from 1875, when the Landore works were under the direct management of Dr. C. W. Siemens." Its adoption in tinplate manufacture was delayed by the fact that it was at first classed with the Bessemer steel employed in the earlier experiments. The latter was unsuitable for conversion into certain qualities of tinplates, "being harsh, springy and subtle, instead of soft and tough." This created a prejudice against the new material, which was regarded as a cheap but unsuitable substitute for iron. Consequently, plates made from Siemens steel were also unfavourably graded, and sold at a lower price than those made from charcoal iron. But this prejudice was gradually removed, and the quality both of Siemens and Bessemer steel improved, and by 1885 seven factories had been erected in the neighbourhood of Swansea for the manufacture of steel bars for tinplate purposes. "Stamping bars of the highest quality were now almost universally made of Siemens-Martin bars, and the rest of the trade used Bessemer bars, or bars made from puddled iron in the ordinary way." Although still somewhat variable in

quality, much of the Bessemer steel was afterwards almost as good as that made by the rival process; but in the interval the latter had acquired an enviable reputation, and superseded charcoal iron in the production of tinplate. Siemens plates consequently commanded higher prices in the market than those made from Bessemer steel.

The competition between iron and steel resulted in a victory for the latter in consequence of the lower cost of manufacture rather than on account of its intrinsic superiority; for the quality of plates made from iron bars was probably better than that of plates made from steel. Three advantages were claimed for steel at the time. In the first place the waste in converting the bar into tinplate was reduced. "It will be evident that when blackplate can be made to go forward to market at £12 per ton, instead of backwards to the forge at 40s., this consideration was important." Moreover, the surface of the steel blackplate was smoother than that of the iron plate, so that less tin was absorbed in the coating process. This economy was of greater importance in the case of the cheaper plate than in that of the better quality. "For the purpose of a provision canister it is sufficient that the iron should be suitably coated to protect the contents: but for heavy stamped ware the iron must be sufficiently well coated to resist years of hard usage." Finally, it was said that the percentage of "waster tinplates" was reduced. About 15 per cent. of plates manufactured from iron were defective; but after the introduction of steel the waste was reduced to about 4 or 5 per cent. Since then it has increased, and is now said to be about 9 or 10 per cent.¹

Several important results followed the substitution of steel for iron.

(1) The prices of tinplates fell almost continuously until 1887. In this year, and subsequently, there was a slight increase, but not in proportion to the advance in the price

¹"Minor defects in plates do not involve a serious loss, as the plates are sold (at a lower price) as "wasters" and "waste-waste," and employed in uses for which such defects are not a serious disadvantage

of tin, nor to the rise in the general level of prices. If the introduction of steel had been delayed until after the boom which commenced in 1887, it is extremely likely that the prices of tinplates would have been much higher.

(2) The trade in tinplate increased by leaps and bounds. Even during the depression of the eighties exports steadily increased, and between 1886 and 1889 an unprecedented advance was made. This, it is true, was not solely due to the introduction of steel: it was partly the effect of those causes which operated everywhere and resulted in general prosperity. But the increase in demand during the general trade depression in the years immediately preceding the boom suggests that the considerable economy effected by the change was one of the factors.

(3) The bar industry was separated from what was afterwards known as the tinplate industry. The manufacture of iron bar was really part of the tinplate industry; the wages paid to the forgemen, who were eligible for membership of the union, were, as already indicated, included in the 1874 scale; and the dispute recounted at the beginning of the chapter involved the men employed in making the bar as well as those engaged in converting the iron into tinplate. But since the introduction of steel the bar (known in the trade as tinplate bar) has been regarded as the raw material of the tinplate industry, which practically begins with the rolling of the bar into plates in the mills.¹

(4) It has already been stated that in 1880 all prices referring to charcoal forges were removed from the association list of wages. It is evident, therefore, that Siemens bars had already partly replaced charcoal iron. In 1886 "the last charcoal iron was made at Lydney."² In 1885 prices referring to coke forges disappeared from the list, because Bessemer bars had driven its rival—coke iron—out of the field.

¹ Strictly speaking, the first operation consists of cutting the bars to the required sizes. To cut the bars cold in the tinplate works is believed to be better than to cut them hot in the steel-works.

² Thomas.

(5) The introduction of steel was one of the causes of the downfall of the masters' association and the final dissolution of the workmen's union. An examination of these combinations during the period of their decay will next occupy our attention.

Sufficient has been written to show that the masters' association was the controlling influence in the trade for some years after the establishment of the standard rate. It was altogether an organisation for the control of the MANUFACTURE of tinplates. It never interfered with prices, which, in the early eighties, were still nominally fixed at the Birmingham quarterly meeting. At first the association was confined to the western district, but its scope was afterwards widened, and all the manufacturers of Glamorgan were eligible for membership. In 1875 thirty-one out of thirty-five firms in the district were included in the association, which naturally possessed great power. For seven years it was exceedingly prosperous, and its influence was, on the whole, very beneficial. It might have used its power to impose harsh conditions upon the workmen; but evidence seems to prove that the latter were generously treated, in spite of the fact that the union and its leaders were consistently ignored. There is indeed much to be said in defence of this policy of non-recognition. For the union was at no time strong in numbers, and the leaders could not rightly claim to represent the main body of operatives. It is less true to say that there existed a union in the sense of a permanent combination of workers, than to say that the period was characterised by a series of temporary associations always created and controlled by the same officials. When trouble threatened, the president and secretary gathered the men together, and prevailed upon them to contribute during the period of unrest. But when peace was restored the majority of the men became quite indifferent, ceased to pay, and to all intents and purposes left the union. People who can recall those days say that almost the only way in which the officials could collect funds was by visiting the factories on pay day, and persuading the men to part with a few

pence. The secretary himself suffered financially through the indifference of those who were nominally members. The union existed in name, it is true; but it was a negligible factor in time of peace, and scarcely a force to be reckoned with at any period of its existence. It was certainly never strong enough to enforce collective wage agreements. The masters were therefore partly justified in ignoring it and in entering into direct negotiation with the men themselves. Early in the eighties the union ceased to exist, and the men remained unorganised until the formation of a powerful wage-protecting association in 1887. But although the earlier union brought little material gain, both leaders and men acquired valuable experience. In short, failure proved to be an excellent lesson, and the way was paved for the formation of a new association for the whole industry.

For seven years there was little change in the membership of the masters' association, which in 1881 controlled thirty firms. But in the meantime the number of factories in the western district had considerably increased, so that although the association controlled practically as many mills as ever before, the proportion of the total production under its control diminished steadily. Further, after the strike in 1881—and largely in consequence of it—the number of members diminished by seven, leaving only twenty-three in 1882. Moreover, the two producing areas were being drawn more closely together by the improvement of travelling facilities. A short time ago a member of a firm which prospered in the seventies stated that as a young man he was compelled to journey by boat from Swansea to Bristol, there being no railway connection. Before the Great Western Railway between Newport and Swansea was constructed the two areas were almost completely isolated, and manufacturers little known to each other. They met at the quarterly meeting in Birmingham, and at special trade meetings held at irregular intervals; but there was practically no other intercourse. Nor was there much mobility of labour between the two districts. Consequently the

need of a united association for the whole of South Wales and Monmouthshire was little felt. But by the eighties the barrier of space had been largely destroyed: the east and west became parts of the same area rather than two distinct areas competing in almost the same manner as South Wales and the United States have done for the past decade. In short, close personal contact, the first requisite of combined action on the part of the manufacturers, was now common, and the desirability of an association for the whole district was generally recognised.

Finally, as already indicated, the conditions of manufacture were completely changed by the substitution of steel for iron and the decay of the forges and puddling furnaces. The existing association, controlling as it did the iron bar industry, had become practically valueless. It was not sufficiently representative of the trade; it lost its power of controlling wages, and during the depression of 1885 concessions and reductions were the rule rather than the exception in the industry.

A new association was obviously necessary, and early in 1885 the old one was dissolved. Almost before it was finally wound up another was formed, which continued in existence until 1889, when, on the formation of the third and strongest association, it became defunct.¹ This interim association was never strong. The first meeting was attended by thirty-seven manufacturers, including some from Monmouthshire and Gloucestershire; but the membership seems to have steadily diminished. It exercised little or no control over wages, and varying rates prevailed during the first two years of its existence; *e.g.*, at twenty-one out of forty-three factories reported upon in June, 1886, the men were either working at reduced wages or—what comes to the same

¹ The period 1885 to 1889 may be regarded as an interregnum. The association was not so rigid as the previous and the subsequent ones. There were, I believe, no articles of association—it certainly did not exercise the same control as the previous one over the actions of the members.

thing—making concessions in sheets.¹ When, two years later, the 1874 list was recovered, it was not in the slightest degree due to the influence of the association, but was the result of the strong policy pursued by the new labour union.

The former, it is true, did once endeavour to bring about a general reduction; and although nothing came of it, the attempt is worth recording, since it marked the establishment of the first joint wages committee after the amalgamation of the masters' associations of Carmarthenshire and West Glamorgan in 1874.

The bogey of foreign competition was raised. German manufacturers were reported to be making an attempt to capture the territories over which we had hitherto held undisputed sway. This was the first occasion upon which serious thought had been given to the possibility of competition from abroad; but the rumour was quite without foundation. Even to-day the German Kartel produces a comparatively small proportion of the quantity consumed within the Empire: the remainder is imported from this country. Yet within five years of the first talk of foreign competition, the United States Government, in passing the McKinley Tariff Act, dealt the British industry a blow from which it did not recover for almost a decade.

But the report of probable German competition provided the harassed employers too good an opportunity to be lost, and they suggested the appointment of a joint committee to discuss the wages rates. The method to be employed by the workmen in electing their own representatives was dictated by the employers' association, which, true to the tradition of the past, quietly ignored the union. The men employed at each factory were requested to appoint a delegate,² and at the conference

¹ Concessions took the form of increasing the standard number of sheets per box, or of making an agreed number of boxes per month without payment.

² I do not know the number chosen, but fourteen attended the first meeting. Although this committee held at least one meeting no result seems to have followed.

of the latter a number of representatives were chosen to act on the joint committee.¹ But if the interim association failed to exercise any control over wages, it succeeded to some extent in mitigating the evil of over-production by restricting the output of a large number of factories.

Attempts had been made in previous years to regulate production. "Engineering," September 13, 1873, reports a meeting of manufacturers at which it was decided to work four days per week instead of six, in order that the output might be reduced by one-third. The demand was said to be curtailed on account of the high prices ruling; but the prices of coal, iron, and tin were so high that tinplate manufacturers argued that they could not sell more cheaply and retain a margin for profit.² Although no evidence is obtainable beyond the export figures for the year, one may confidently assert that the majority of the manufacturers did not reduce the output of their factories. It was impossible to enforce such an agreement, so that the willing employer enjoyed no security that his example would be followed by his competitors.

¹ It is worth mentioning in passing that the failure of the association to enforce a uniform scale for the industry lessens the value of the wages statistics given in the wage census of 1886 and quoted in an appendix.

Returns were obtained from nine firms, but no indication is given of the extent to which the conditions prevailing in the selected factories were representative of the whole. To base the statistics of the whole trade upon the returns from such a small proportion of firms when the conditions were so peculiar, was to incur grave risk of error. The inclusion of one factory at which unusually large concessions or reductions were made would have an excessive influence upon the final result. The value of the figures is further lessened for another reason. Puddling rates seem to have been included, but in the year of the investigation it was the exception for a puddling furnace to be joined to the tinplate factory. A new condition of things had arisen, and the separation of the bar and tinplate industries was almost complete. Consequently the inclusion of rates for puddlers would unduly influence the results and possibly convey an erroneous idea of the conditions of labour in tinplate manufacture. The futility of tables indicating the general rate of wages has already been shown

² This is undoubtedly an exaggeration. While it may have been true of some manufacturers it cannot possibly have been true of the majority, for it is well known that large profits were made in the trade during this year.

The beneficial effect to each of such a policy of restriction was roughly measured, not by the reduction effected at his own factory, but by the total reduction at the other factories; just as the share of the profits of a workman in the old associations of producers were determined by the combined efficiency of his fellow-workmen rather than by his own efforts.¹

Moreover, if the employers as a body had consented to abide by the decision of the meeting, there was no guarantee that the output in the four working days would not be increased to the customary weekly production prior to the agreement.

The next reported attempt at limiting output was in 1877, when the masters' association resolved that the factories under its control should close one week in three. The conditions in this year differed from those prevailing in the last case: the association was able to enforce its decision on its members. But there were no means of preventing those employers from producing the same quantity in two weeks as previously had been produced in three. Moreover, the association controlled but a section of the trade, and the non-associated employers entirely disregarded the resolution of the association. That this attempt also ended in failure is indicated by the fact that later in the year the association not only refused to accept a motion for a further reduction, but rescinded its previous resolution.

In 1885 the interim association made a much more serious attempt to relieve the market by controlling

¹ An individual employer would gain more by continuing to work six days and selling at the slightly lower price which the additional output of his factory would create, than by selling the smaller quantity produced in four days at a slightly higher price. This was especially true of those days, when competition was not very keen, the number of firms was large, and the stocks in factories and warehouses, etc., were not so well known, and when consequently it needed a large rather than a small increment of supply to produce a material change in prices. In a highly developed market such as exists at present, a very small excess in producing capacity might seriously affect the prices; and applied to those conditions the above statement would need to be modified, and more especially when the competing firms are relatively few in number.

production. The depression, which was due to an abnormal increase in producing capacity, was at this time very severe, and the trade was said to be passing through a critical period. The association called a general meeting of tinplate and bar-iron makers to consider the question of a simultaneous reduction in make. The meeting, at which thirty-seven works were represented, was held on June 27th; and the employers present bound themselves to close their factories one week in each of the remaining six months of the year, provided that the owners of three-fourths of all the mills in operation at this time did the same. This agreement was made legally binding, and a heavy penalty would have been imposed for non-observance. The requisite number was quickly made up, and the resolution came into force in July. Apparently every employer who signed the agreement observed it in every detail; but the agreement itself was inadequate. Although at least three-fourths of the mills in the trade were idle one week in four until the end of the year, in a large number of cases the customary output for the month was made up in the three weeks during which the factories were at work; consequently it was found necessary in November to pass another resolution preventing the signatories from increasing the output of their mills during the working weeks beyond the average output for the corresponding period previous to the agreement. Apparently many of the employers were dissatisfied with the result, for at the beginning of the following year they urged the increase in the American trade as an excuse for not renewing the agreement. If sufficient material were available for examination, it would not be surprising to find that, although they did not themselves recognise it, the optimistic view of the employers was due more to the results of the restriction of output after the November resolution than to the increase in trade with America; for in a very short time depression again set in and led to several wages disputes.

(e) THE MONMOUTHSHIRE STRIKE

The most serious of these—indeed, one of the most important disputes in the history of the trade—was one which occurred in Monmouthshire. The chief interest of this strike, however, lies in the fact that it resulted in the formation of a wage-protecting association which was destined to play an important part in the history of the trade for the next ten years. Moreover, it probably made the employers more fully alive to the need of combined action. In short, the strike brought home to the employers and workmen in a manner which no previous event had done, the necessity for regarding the whole of South Wales and Monmouthshire as a unit.

The year 1886, like most of the previous ones, was characterised by low prices on a steady market. The "Cambrian,"¹ in a review of the trade for the year, states: "The demand for consumption has been good, but during a large part of the year the production has been in excess of the requirements: further, the uncertainty prevailing as to the financial position of some makers, and the certainty that a few others were not sufficiently strong to hold out against a drooping market, had kept prices anything but buoyant: whilst the lower rates at which black sheets, whether the cokes or steels, have been quoted, and the state of transition from cokes to steels . . . owing to the action of the makers of Bessemer steels, has been the means of reducing prices to as fine a point as possible. These are the principal features of the tinplate market during the past twelve months, and they, in combination with the fact that nearly every industry has been at the mercy of 'bears,' sufficiently account for the low range of value which has prevailed throughout the year under review."

Yet, in spite of continued depression, a new company was floated in November, and another new factory was opened early in 1887. This confirms the view suggested by the history of the previous three years, that the

¹ A Swansea weekly newspaper, which at one time was the "Times" of Wales in point of reliability.

employers who failed were those who owned old-fashioned mills, and that the low prices then ruling, while unremunerative to such manufacturers, really left a margin for profit to others who employed more modern methods : for example, of the 346 mills in operation in the summer of this year, forty-six were still being driven by water power. The workmen found it impossible to maintain the 1874 rate during this period of depression. At several of the factories lower rates were accepted, or concessions were granted. It was stated at this time that one employer enjoyed concessions equivalent to between 25 and 30 per cent. of the wages paid. Naturally a demand for reductions and concessions followed at other factories, and from July to October the workmen at Llantrissant fought against a proposal for a reduction of 10 per cent. A similar demand was made by some of the employers in the western district, where concessions were fairly numerous, but instead of closing down the factories, it was decided to continue on a daily contract at the old rate.

Then followed a general demand by the Monmouthshire employers for a reduction of 10 per cent.¹ It was a natural corollary to the developments in the west. The eastern manufacturers were paying higher wages, and in consequence were suffering keenly on an over-stocked market. They merely wanted to compete with their western rivals on terms of equality. And although they failed to achieve their immediate object, the ultimate object they had in view was attained. The demand for a reduction was strongly resisted by the workmen, and in November and December the Monmouthshire factories, containing about seventy mills, were closed. Although no union existed at the time, the workmen of Glamorgan and Carmarthenshire promised to assist their brethren of the east. They agreed to pay a percentage of their own wages (in some cases 5, in others $7\frac{1}{2}$) into a strike fund, and further determined to grant no concessions to their own employers after December 31st. The affairs of the men were conducted by meetings of delegates from all the trade centres.

¹ This represented a reduction of about threepence in the cost per box of plates.

The fight in Monmouthshire directly affected the men in the western district, since success on the part of the employers would almost certainly be followed by reductions and concessions in all parts, and greater reductions in those works already paying less than the standard rate. Sectional action was taken because the men were not sufficiently well organised to call a general strike. The position in Glamorgan was sacrificed for the moment, and the efforts of all the men were concentrated upon the struggle in Monmouthshire.

But the response of the workmen of the west to the call of their leaders was very poor: promises were not fulfilled. Only about £500 was subscribed in eight weeks by the 5,000 men fully employed during that period. Moreover, the output of their own mills in the west was increased by their own efforts to such an extent that the stoppage produced little effect on the market. Although the exports during December and January were heavier than they had ever been before in those months, and although the normal output of the mills affected by the strike represented about 100,000 boxes per month, stocks had increased at the end of January by 70,000 boxes!

Fortunately for the men trade continued to improve very rapidly, and prices gradually rose; and by the end of April all the works in Monmouthshire were again in full operation, and the men employed under the conditions prevailing before the dispute. The men won after a strike of five or six months. In the first great dispute, in 1874, the workmen fought bravely, but in vain. The industry was then entering upon a period of depression, and market prices were steadily falling. In view of the lack of support from the west, it is extremely likely that under similar circumstances the men of Monmouthshire would have failed in 1886. But fortune favoured them on this occasion. The masters demanded a reduction when the trade was emerging from a period of depression and the market was showing unmistakable signs of improvement; so that they were compelled to withdraw

their demands in order that they might share in the returning prosperity.

The results of the strike were important. The frequent meeting of delegates brought the men of the east and west closer together, and made it easy to create an organisation of wider scope than those previously in existence. The dispute itself, together with the widely-spread concessions which created it, proved the necessity of an organisation for enforcing uniform conditions upon the whole trade. And the returning prosperity provided an excellent opportunity for pursuing an aggressive policy. Consequently a union, which was destined to play a leading part in the history of the next ten years, was formed shortly after the strike terminated. The new union, which embraced the whole of South Wales and Monmouthshire, was so powerful compared with those previously existing, that when the new masters' association was formed two years later, the latter was compelled to recognise it. This was probably the first time in the history of the trade that a workmen's combination had been acknowledged by the employers' association as a factor to be reckoned with. No time was lost in re-establishing the 1874 list, and in a few months uniform rates once more prevailed throughout the trade.

The conditions prevailing in 1886, the dispute in Monmouthshire, and the subsequent action of the men emphasised the need of a strong employers' association; and in 1889 the South Wales, Monmouthshire, and Gloucestershire Tinplate Makers' Association was formed, replacing the old one, which represented less than one-half the trade. Like the workmen's union it extended over the eastern and western districts. These areas, so remote from each other in the decade with which this chapter began, had by this time been brought much closer together; community of interests, which had long been recognised to exist by the manufacturers of West Glamorgan and Carmarthenshire, was now recognised by all engaged in tinplate production in the three counties. Combined action was inevitable.

CHAPTER IV

THE TRANSITION PERIOD

THE history of the tinplate trade during the last quarter of the 19th century has been divided into two main periods—that of monopoly, ending with the imposition of the McKinley tariff in 1890, and that of competition. The characteristics of the first differ from those of the second. While, during the first period, the British manufacturers depended mainly upon the American market, they also enjoyed a monopoly of nearly all other markets. The demand for tinplate increased rapidly and continuously, and prices were generally high. It is true that the industry was often in a depressed state, and that many manufacturers failed. The evil of over-production frequently made its appearance, and prices were then unremunerative to the owners of some factories. But the detailed history given in the last chapter clearly indicates that such over-production was due more to the policy of the manufacturers themselves than to the state of the market; and that prices during the depressed periods were unremunerative generally only to those employers who refused to move with the times.

The industry before 1890 resembled one protected by a tariff. When an industry is established by means of a high import duty upon the article it produces, the manufacturers possess at least a partial monopoly of the home market. They enjoy an artificial advantage over those engaged in the same industry in other countries. The exclusion of imports results in larger profits for a time at home, and an influx of fresh capital into the trade. Severe competition follows, which threatens to ruin the weaker firms, and from which there can be but one escape

—combination. The struggle is changed from one between a multitude of small manufacturers to a no less keen fight between a few large combines or trusts; and this latter cut-throat competition may result either in a working agreement, as in the Scotch and North of England steel trade, or in the formation of a larger trust possessing a partial or complete monopoly of the home market. Such was the history of the steel trade in the United States.

The position of the South Wales tinplate industry was even more favourable than that of an artificially protected industry. Not only was the home market secure, but the manufacturers also enjoyed a monopoly of practically all foreign markets. The natural expectation, then, is that this monopoly would have fostered the growth of a trust, or at least would have led to the formation of an agreement by which the manufacturers might reap the fruits of their initial advantage and minimise the periodical losses from competition. As in the case of an industry artificially protected, there were periods during which enormous profits were enjoyed, each followed by a rapid increase in the number of mills and consequent over-production and depression. And attempts which were made to mitigate the evil of over-production generally ended in failure. Price-list agreements were rarely observed: attempts to regulate the output were frustrated by the policy pursued by some manufacturers of increasing the output during the working periods to such an extent as to render a "stop week" futile. It was impossible to raise prices for a long period by any form of agreement, since new competitors were encouraged to enter the trade —a new tinplate factory could be erected cheaply and quickly. Moreover, the depression during a period of over-production was not so severe as is sometimes supposed. Many manufacturers failed, it is true; but they employed antiquated methods of production; and those who made use of the newer methods were able to manufacture at a profit. Finally, the demand for tinplate was increasing steadily, and an excess in producing

capacity was generally of short duration. Consequently, the need for combination was not so severely felt as it would otherwise have been.

During the second period the conditions were entirely different. The manufacturers were challenged in the largest market, and ultimately the fight ended in a victory to the new competitors. The McKinley Tariff Act of 1890 imposed a heavy protective duty on tinplate imported into and consumed in the United States: a competing industry was established in that country, and after a struggle of half a dozen years, the South Wales manufacturers were forced to withdraw. Exports to the States fell almost continuously after 1891, and until new markets were discovered and the old ones developed, the producing capacity was far in excess of demand. Prices fell in many instances below cost, a large number of manufacturers failed and wages were everywhere reduced. Yet there was no serious attempt at combination on the part of employers. A wise policy would probably have reduced the loss considerably, and a price-list agreement had greater chance of success than ever before, since there would have been no inducement to new competitors to invest capital in the trade. But the manufacturers preferred to fight—perhaps they realised that they were too numerous to admit of successful combination.

In the United States the infant industry grew rapidly, and by 1897 the number of mills was in excess of requirements. The position was practically the same as in this country, but while the Welsh manufacturers took no steps to eliminate competition, in America a trust appeared before the end of the century. A closer examination of these different tendencies will be made in the chapters which follow.

The last few years of the period of monopoly deserve a chapter to themselves; partly because they mark the transition from the old conditions to the new; partly because a detailed examination of them is necessary to a clear understanding of the events which followed the imposition of the McKinley tariff; and, finally, because

the speculative fever which ran so high in the country during the period ending with the Baring crisis spread to this and the dependent industries. From 1887 to 1891 exports increased by leaps and bounds, and prices ruled generally high. Occasionally the rapidity with which new mills were erected caused over-production, and the market prices suffered; but the set-back was always of short duration. On the whole, it was one of the most prosperous periods in the history of the trade. It is true that the rise in prices exaggerates the profits enjoyed during this time. Raw materials, like commodities generally, advanced considerably. Nevertheless, there is little doubt that in the tinplate trade a considerable margin existed between cost and price, and that nearly all the firms paid large dividends.

Mr. Hyndman, writing of this period of general prosperity in the United Kingdom, states that "the special feature of this inflation, which lasted for nearly three years, prior to the crash of 1890, was the establishment of trusts, combinations, corners, and promotion companies on similar lines to those adopted in America." Not the least important of these was the corner in tin. In April, 1887, a French syndicate, with a capital of fifty million dollars, bought up all the tin then on the markets of the world, with options on all to be produced within two years. The total annual production at this time was about 40,000 tons. Of this rather more than half was obtained from the Malacca district; Australia and England each supplied nearly a quarter; and the small remainder was divided between Bohemia, Saxony, Spain, and Peru. More than half the total output was consumed in the United States. The immediate effect of the monopoly on the tinplate industry was to reduce profits. While the price of tin was more than doubled, no sympathetic movement in the prices of tinplates followed, for the producing capacity was still greater than was justified by the demand. Some of the manufacturers consequently proposed to form a price-list agreement, under which the minimum price was to be 15s. 6d. per box (f.o.b.

Liverpool) for ordinary IC coke tinplates. The proposal did not mature. The larger makers refused to support it, not because they were satisfied with the existing state of the market, but because every previous attempt had ended in failure. They held that, as in the past, the smaller and weaker manufacturers, relying on immediate sales for capital to continue operations, would be unable to hold out long enough to force consumers or merchants to buy at the agreed price. Moreover, if by combined action they succeeded in raising prices, the position of the tin syndicate itself would be strengthened and the price of tin would rise still higher.

It was then suggested that the richer manufacturers should purchase the stocks of their weaker competitors, and hold them until they succeeded in obtaining their own prices for tinplates. But obviously such a policy would have involved great risk. The price of tin might at any time return to the normal, and in such an event the larger manufacturers would suffer heavy losses, having bought from the smaller ones at prices based upon cost of production when tin was sold at inflated prices. It was stated at this time that the tin syndicate would have collapsed almost immediately had it not been for the action of a few buyers, who purchased large supplies at high prices. Early in 1888 the difficulties of the syndicate began. Holding a larger supply of tin than they were able to dispose of they were forced to offer more favourable terms to tinplate manufacturers. They realised the weakness of their position, and recognised the necessity of immediately getting rid of some of their stocks to enable them to maintain a high price later. Consequently they offered to sell for future delivery at a price determined, in the event of a fall of market prices, by the then prevailing price, and, in the event of a subsequent rise, at the price ruling when the bargain was made. In other words, while buyers would gain by any fall in market prices they would suffer no loss by a rise. But the manufacturers were not tempted by this offer; they continued to purchase as little as possible, and in this way assisted

the downfall of the syndicate at the end of April. On Monday, April 30th, through the refusal of the syndicate to buy large quantities offered, the price of tin on the London Metal Exchange fell from £166 per ton to £105. The following day it fell to £91, and two days afterwards to £88—a reduction of nearly 50 per cent. in less than four days. It is hardly necessary to state that the operations of the tin syndicate did not affect all tinplate manufacturers alike. Some of the latter had purchased supplies before prices began to rise, and these benefited to that extent by the action of the syndicate. Probably it was they who prevented a greater sympathetic rise in prices of tinplates. It is extremely likely, too, that they were the richer and larger makers. Anticipating a rise in prices they bought large stocks of the imperishable commodity for future requirements. On the other hand, the smaller and poorer manufacturers, who were accustomed to purchase smaller quantities, suffered heavily by the action of the syndicate. But on this point it is impossible to make more than a general statement.

Statistics of exports suggest that the period under consideration was one of unusual prosperity, due almost entirely to the rapid growth of the American canning industries. But, although there was a decided boom in trade, the increase in the volume of production and employment is probably misleading when employed as a measure of profits. It was a period of general industrial activity and high prices; and for some time in 1889 the costs of raw material increased more than proportionately to the rise in prices of tinplates. Not until the spring of 1890, when tariff legislation in the United States led to a special temporary boom in the tinplate industry, did the manufacturers of South Wales reap the full benefit of the trade revival.

Repeated over-production,¹ uncertainty in America,

¹ Inattention to the needs of consumers, rather than general over-production was sometimes the cause of price depression, for example, the "South Wales Daily News" pointed out on October 8th that "manufacturers turn out 14 x 20 and 14 x 19½ irrespective of demand, and do not make odd sizes which are also required. If they

and successful bearing operations by merchants arrested the upward movement of prices during 1889, so that while the cost of raw materials increased by at least 3s. 3d. per box, the price of tinplates advanced only about 3s. 4½d. Early in that year a proposal was made to secure the full benefit of improving trade by the formation of a syndicate of similar character to the tinplate trust afterwards formed in the United States. The only part of the scheme which calls for comment is a suggestion to include in the articles of association a clause limiting the net profit to 1s. 6d. per box. The manufacturers rejected the proposal, but the meetings held to consider it were probably not without influence upon the formation of the masters' association in October.

Other suggestions for effecting a rise in prices were considered from time to time. The workmen, fearing that relatively low prices might lead to a demand for reductions in wages, favoured a general stoppage for a fortnight. To this proposal many employers objected, mainly on account of the failure of such a method in the past—especially in 1885. Previous experience showed the ineffectiveness of such a method of reducing output. Nor did a stoppage of one week in every month promise greater success, for by an increase in the hours of work during the week-end the customary output per month would be maintained. The workmen, on the other hand, argued that the method which had failed when the trade was unorganised would probably prove successful if adopted by a masters' association, supported by a strong labour organisation. Other employers objected to periodic stoppages on the ground that any attempt at limiting output would be likely to strengthen the case of United States protectionists then agitating for a higher import duty on tinplate.

Ultimately, after a conference between the two associations, a week's cessation in March was agreed to; and

turned their attention to odd sizes, orders for which are often months overdue, then the supply of 14 x 20, etc., would be less and prices higher."

the fears of the employers were realised. Although sixty-eight out of eighty-six works were idle stocks were not diminished, production was not appreciably lessened for the month, and prices did not improve. An attempt was then made to reduce the wages rate, and a new scale, known as the "green list" was proposed. The workmen's leaders successfully opposed a reduction, rightly arguing that it would prove no remedy.

Subsequent attempts to relieve the market by enforced idleness proved no more successful than the first;¹ and prices continued relatively low until an abnormal demand from America, which made its appearance in May and continued for more than a year, produced a sharp rise.

The following year was perhaps the most remarkable in the history of the trade. The McKinley Tariff Act was passed, imposing, for the first time in the history of the United States, a protective duty on imported tinplate. The following table shows that duties had been levied for at least half a century; but these were in all cases for revenue purposes, and varied with the needs of the Treasury. The high rate of 1862, necessitated by the expenditure incurred during the civil war, was thought by some to be sufficient for protective purposes; but the attempt made in that year to establish an American industry failed completely.

1842		$2\frac{1}{2}$	per cent. <i>ad valorem</i>
1846		15	" "
1857		8	" "
1861		10	" "
1862		25	" "
1872	.	22 $\frac{1}{2}$	" "
1875		1.1	cent per lb.
1883		1	" "

A fierce tariff controversy was started 1888, when, in the Mills Tariff Bill, which was accepted by the House

¹ A *pro rata* reduction in the output of each mill was also proposed. If combined action had been possible such a method would probably have produced the desired result. Combined action for the purposes of a stop week was not so difficult to secure, for a manufacturer who was unwilling to reduce output would expect to make good the deficiency in the working weeks.

of Representatives, it was proposed to abolish the revenue duty of 1 cent per pound on imported tinplate. The iron producers of the north, who were now beginning to feel the competition of the southern manufacturers, fought against the proposal and demanded assistance in their effort to create a market for iron by establishing a tinplate industry. The Senate accepted an amendment to the original Bill, and the duty on tinplate was doubled. But the subsequent defeat of the Government measure, and the victory of the Republican party at the polls were followed by the introduction of the McKinley Bill, which was avowedly protectionist. When this became law, in October, 1890, it was enacted that a duty of 2.2 cents per pound on imported tinplate should come into operation on July 1, 1891. While the Bill was under consideration the secretary of the American Tinplate Association (an organisation composed entirely of sheet-iron and steel manufacturers, whose only claim to the title consisted of the ownership of an exhibition tinplate mill erected for political purposes the year before!) appeared before the Committee of Ways and Means and promised that the imposition of the duty finally fixed would be followed by the erection, within a year, of sufficient plant to manufacture all the tinplate consumed in the States. And the interval between the passing of the Act and the date upon which the duty came into operation was granted partly to enable factories to be erected, and partly to enable consumers to prepare for the change. It is scarcely necessary to add that the promise was not kept; no tinplate mills were erected in the interval. But, as will appear later, political changes and uncertainty regarding future legislation, together with the financial conditions then prevailing, provided some excuse for non-fulfilment.

The opposition of the National Iron Roofing Association to the importation of tinplate was little less vigorous than that of the rival organisation. They desired a heavy duty, not so much to encourage tinplate manufacture as to eliminate the competition of imported terneplates with sheet-iron and steel and galvanised sheets. A prohibitive

duty would compel builders to utilise the products of the Association for roofing purposes.

Among the arguments employed by protectionist politicians in favour of the duty was that urged by President Harrison, who emphasised the danger incurred by manufacturers in the canning industries in depending entirely upon a foreign country for a supply of raw material. But it is plain from the complaints of tinplate consumers that they, at least, preferred the risks of war, and of price discrimination by possible foreign monopolies in the future, to the certainty of high prices under protection!

The most serious arguments were those employed by the American Iron and Steel Association. Taken together they constituted a special application of the "infant industry" argument for protection. In its general form the argument assumes that the country about to establish the new industry enjoys certain natural facilities which, once they can be utilised, will enable it to flourish without artificial protection. At the beginning of its industrial career it cannot take full advantage of these natural facilities, for they exhibit their full effect only when production on a large scale has been established. Without protection the industry might be killed in its infancy by foreign competition, not because the competing country is naturally better suited to the manufacture of the product, but because the industry is long established, and gains by all the economies of large-scale manufacture. The older industry is also able to utilise to the full the artificial or acquired advantages which result from concentration of production, but are the monopoly of no country. To establish or foster an industry is an expensive process, and for a time it is necessary to secure the home market by means of a tariff. To put it otherwise, the nation is to benefit by the existence of the industry; consequently, part of the expense of creating it should be borne by the members of the nation. If the main assumption proves to be correct in the case of any particular industry the tariff is required, other things being equal, only for a

time, and a successful application of the principle is proved in the subsequent removal of the tariff as being superfluous. It will be evident at once that to afford full protection to the home manufacturer the incidence of the tax should fall entirely upon the consumer, *i.e.*, the price of the imported article should be raised by the full amount of the tax.

Early in 1890 the American Association issued a bulletin in which it was argued that tinplates would soon be manufactured as cheaply in America as in Wales, for not only would cheap steel be available, but the facilities for obtaining tin were already as great as elsewhere. "Besides foreign sources of supply, which are as open to us as other countries, we have tin deposits in the Black Hills of Dakota in our own country which are now being developed, and there are tin deposits in other parts of the United States." But for a time protection was needed against the relatively cheap hand labour employed in the manufacture of sheets in South Wales, and to counterbalance the difficulty of obtaining cheap female and boy labour in America. While at that time tinplates were "the product of hand labour, and a great deal of hand labour," the Association evidently believed that when the new industry had been firmly established machinery would be invented which, if it did not remove the necessity for female labour, would at any rate lessen its importance, and reduce the handicap created by the payment of higher wages to skilled workmen. Although a considerable duty still seems to be a condition of profitable manufacture, the history of the past twenty years has probably fulfilled the prediction of the writer of the bulletin; for to-day tinplate production probably involves a smaller net expenditure of human energy in America than in South Wales.

The following is the clause in the McKinley Act dealing with the duty on tinplate:—

"All iron or steel sheets or plates, and all hoop, band, or scroll iron or steel, excepting what are known commercially as tinplates, terneplates, and taggers tin, and hereinafter

provided for, when galvanised or coated with zinc or spelter, or other metals, or any alloy of those metals, shall pay $\frac{1}{4}$ of a cent per pound more than the rates imposed by the preceding paragraph upon the corresponding gauges, or forms, or common or blacksheets or taggers iron or steel and on and after July 1, 1891, all iron or steel sheets, or plates or taggers iron coated with tin or lead or with a mixture of which these metals or either of them is a component part, by the dipping or any other process and commercially known as tinplates, terneplates and taggers tin shall pay 22 cents per pound *Provided* that on and after July 1, 1891, manufactures of which tin, tinplates, terneplates, taggers tin, or either of them are component materials of chief value, and all articles, vessels or wares manufactured, stamped, or drawn from sheet-iron, or sheet-steel, such material being the component of chief value, and coated wholly or in part with tin or lead or a mixture of which these metals or either of them is a component part, shall pay a duty of 55 per cent *ad valorem*: *Provided further* that on and after October 1, 1897, tinplates and terneplates lighter in weight than 63 pounds per 100 square feet shall be admitted free of duty, unless it shall be made to appear to the satisfaction of the President (who shall thereupon by proclamation make known the fact) that the aggregate quantity of such plates lighter than 63 pounds per 100 square feet¹ produced in the United States during either of the six years next preceding June 30, 1897, has equalled one-third the amount of such plates imported and entered for consumption during any fiscal year after the passage of this Act, and prior to said October 1, 1897 *Provided*, That the amount of such plates manufactured into articles exported and upon which a drawback shall be paid, shall not be included in ascertaining the amount of such importations *And provided further*, That the amount or weight of sheet-iron or sheet-steel manufactured in the United States and applied or wrought in the manufacture of articles or wares, tinned or terneplated in the United States, with weight allowance as sold to manufacturers or others, shall be considered as tin and terneplates produced in the United States within the meaning of this Act."

It will thus be seen that the one object of the duty was to create an American industry for tinplate manufacture. If it failed to achieve its purpose within six years it would automatically disappear. While the subsequent operation of the duty was conditional (the proviso having probably

¹ This limitation of weight was necessary to prevent the inclusion of galvanised sheets within the terms of this Act.

been inserted with the idea of placating the consumers), a much smaller industry than appears necessary at first sight would satisfy the requirements of the Act. In the first place, the Treasury department ruled "that imported blackplates dipped in this country for the purpose of tin and terneplates are included within the paragraph referred to."¹ Consequently, it was only necessary to erect "dipperies" or tinhouses in America for coating Welsh blackplate, in order that the final product should be included as American for the purposes of the Act.

In the second place, it was obvious that between October 9th and July 1, 1891, importations from Wales would be enormously increased in anticipation of the duty, so that very little would be required during the first year of protection. Nevertheless, for the purposes of the Act the imports for that year would be compared with the (probably inflated) American production for the most successful year before 1897. Finally imports for home consumption alone would be accepted for comparison. A large percentage of imports were re-exported as caseings for oil, fruit, etc., and would enjoy a rebate of 99 per cent. of the new duty. For these reasons a comparatively small unstable industry would have been sufficient to secure the permanent operation of the duty. But, as will be shown in the next chapter, the conditions were completely altered by the Wilson Act three years later.

The duty of 2.2 cents per pound amounted to 9/10.8d. per standard box. The following duties were also placed upon blackplate:—

(1) Blackplate—pickled, cold rolled and annealed (*i.e.*, ready for tinning), 1.65 cents per pound or 7/5.1d. per box.

¹ In the House of Representatives in June, 1892, Mr. Shively stated that "The iron or steel bars need not be American, the tin need not be American, and the lead need not be American. Here," (exhibiting it) "is a sheet of the blackplate ready to be coated with tin. Under this ruling by the Treasury Department, this blacksheets may be hot rolled in Wales, annealed in Wales, cold rolled in Wales, boxed and imported by one of our tinplate manufacturers into this country, dipped in imported tin, and returned to the Government as tinplate produced in the United States." He might with truth have said, ". . . boxed and imported by an imported manufacturer, dipped in imported tin by imported workmen!"

(2) Blackplate, sheared and opened (*i.e.*, "rough black-plate," before pickling), 1.4 cents per pound or 6/3.6d. per box.

Consequently, the complete process in the mills enjoyed protection to the extent of 7/5.1d. per box, and that of tinning 2/5.7d. per box. It was commonly believed that neither process was sufficiently protected, and a number of Welsh manufacturers who visited the States at the time stated unhesitatingly that an American industry could not be created under such conditions, even on the assumption that the whole of the tax would be paid by the consumers. Climatic conditions were unfavourable; during the summer months the heat was so intense that it would be impossible to operate the furnaces. Moreover, the raw materials were so scattered in the States that the cost of assembling them would render it impossible to compete successfully with the industry of South Wales, where steel was produced near the coal mines and tin was conveyed from a neighbouring county. Finally, tinplate manufacture involved considerable skill, both in management and in workmanship, so that Americans had little chance of success without expert assistance from Welsh manufacturers and workmen. Few business men predicted the rapid growth of a tinplate industry in the United States.

The tariff controversy in America reacted very strongly upon the Welsh industry. We have already seen that during 1889 and the early months of the following year the prices of tinplate and raw materials fluctuated considerably. They rose with the general rise in prices, and in consequence of a rapid growth of the American canning industries; but the rise in prices of tinplate was arrested more than once by over-production—the producing capacity increased even more rapidly than demand. The lowest monthly average—13s. 6d. per standard box—was reached in May, 1890. During the spring, in spite of the comparatively low prices then ruling, American buyers, anticipating a reduction in the existing duty, purchased only what was absolutely necessary. But towards the

middle of the summer, when the introduction of the McKinley Bill made an advance in the duty almost inevitable, demand increased and prices commenced an upward course which was continued for several months. The price of a standard box reached 17s. 9d. in October and 18s. 3d. in the following February and March. During the interval between the passing of the Act and the first imposition of the new duty, merchants and consumers purchased all available supplies, and filled manufacturers' books with orders conditional upon delivery before July 1st. Prices increased on account of a tax which had not yet come into operation. During this boom enormous profits were made by tinplate manufacturers; every factory was in full operation day and night, the output per mill was increased, mills once regarded as obsolete were pressed into service and new ones erected. In 1889—itself a prosperous year, measured by volume of production—there were 478 mills at work; in a few months the number had been increased to 519. The boom naturally extended to the steel industry, and the price of tinplate bar rose in sympathy.

It is probable, however, that the market prices exaggerate the total profits realised at that time. Several of the manufacturers, having entered into long contracts at prices below the subsequent market quotations, were unable to reap full advantage of the boom.

In the early part of 1891, when prices were so high, demand from foreign countries fell off. Manufacturers entirely neglected what orders there were, except in cases of contracts the fulfilment of which could not be postponed. Consumers in this country received similar treatment. Shipments of tinplate to the States practically ceased in the last week of June, and soon afterwards the neglected markets received attention. Prices also fell, and by the end of the month the makers' quotations were as low as 13s. 3d.—13s. 6d. Thus began a period of depression which continued with more or less severity until 1897. The American market for Welsh plates steadily grew smaller, and until its place had been taken by others, low

prices ruled. The history of the next six years is one of disputes between masters and men, of struggles against a reduction in the standard wages rate, and against violations of the wage contract by individual employers.

Turning to America, we find that the price of tinplate at the beginning of 1890 was \$4.7 per standard box; but by May it had fallen 30 cents as a result of over-production in Wales. During the summer the market recovered, and ultimately \$5.45 was reached. Thus the mere anticipation of the duty raised the price by practically a dollar per box. The highest price reached after the duty came into force exceeded this by 5 cents only, while after six months of the duty the price was actually lower by 10 cents than that which prevailed ten months previously. Consequently, nothing was gained by postponing the operation of the duty until July. One—perhaps the main—object of the Senate was to guarantee supplies from Wales, but these supplies could only be obtained at as high a price as would have prevailed if the tax had come into operation at once. Moreover, if the tax had been levied in October, when the Act was passed, better protection in the experimental stage would have been afforded the American manufacturers, since much of the demand actually concentrated on the intervening period would have been spread over the year 1891-2. The enormous demand for tinplate for delivery before July not only caused extremely high prices to rule, but also in many cases resulted in the manufacture of plates of much poorer quality. The product at this time was so imperfect that the percentage of waste was said to have increased 20 to 25 per cent.

CHAPTER V

THE EFFECTS OF AMERICAN TARIFFS

(a) THE GROWTH OF THE INDUSTRY IN AMERICA

IT is not surprising that, in spite of the difficulty of manufacture and repeated failure in the past, protectionist America determined to establish a tinplate industry within its borders. On the one hand the fruit, vegetable, meat and fish canning industries were growing rapidly and providing an expanding market for the Welsh product; the development of the mineral oil industry, and especially the formation and expansion of the Standard Oil Company, resulted in an enormous increase in demand for oil plates; the exploitation of new areas and the growth of the building trades reacted favourably upon the demand for terneplates. On the other, the competition, within limits, of the imported terneplate with the products of the sheet-steel industry, and the growth of the iron and steel industries, accompanied, in some cases, by more intense competition among manufacturers, re-awakened the desire to control the production of roofing plates and to provide an additional market for the semi-manufactured steel by the creation of a tinplate industry. Thus the market for tinplate was rapidly growing, and the need for a market for steel, such as a tinplate manufacturing industry would provide, was becoming more evident.

But, in spite of the high degree of protection apparently afforded by the duty, doubts were expressed regarding the possibility of successful competition with Welsh manufacturers. The raw materials of both the steel and tinplate industries were widely scattered. Climatic conditions were unfavourable. The various stages of steel

production were already so strongly protected that the money cost of producing steel bars was much higher than in Wales. Finally, since the direct labour cost of manufacture was so much greater in the tinplate industry than in other constituents of the iron and steel group, it was feared that, even if the difficulty of obtaining a sufficient supply of skilled workmen were surmounted, this element of cost would prove too heavy. These opinions were shared by the majority of Welsh manufacturers.

The history of the first three years appeared to justify the pessimistic views expressed, as well as the strong opposition of the tinplate consumers to the tariff. For the new industry was slow to take root. During the fiscal year ending June 30, 1891, there was no production on a commercial scale. Nor, in spite of the promise of the Tinplate Association referred to in the previous chapter, had any serious preparation been made for the future. And yet the Association was composed of manufacturers of sheet-steel, whose factories could easily be made suitable for the manufacture of tinplate! During the first year of the operation of the duty approximately 13,65 millions pounds of plate were produced, of which 9.1 million pounds were terneplate, and 4.54 tinplate. In this year several Welsh manufacturers established tin-houses in the States, in which blackplates from their own Welsh factories were coated with tin by Welsh workmen. Altogether about 9.8 million pounds of blackplate were imported during this year. And since this trade was practically non-existent two years before, the probability is that nearly all were intended for tinning purposes¹. By the end of the fiscal year twenty-six factories had been erected, of which four produced tinplate only, fourteen terneplate only, and the remaining eight both kinds. For

¹ A Government investigator, Colonel Ayer, issued a report the following year upon the growth of production of tinplate in America, from which it might be assumed that most of the imported blackplate must have been used for other purposes. But close examination will show Colonel Ayer's figures to be inaccurate in more than one respect.

the next two years a steady advance in production was made, which was more marked in tinplate than in terneplate. Probably this was partly due to the fact that sheet-steel and galvanised sheets had largely displaced the latter commodity for roofing purposes.

A large proportion of the American product was made from imported blackplate. As already indicated, the protection afforded the process of converting bar into blackplate amounted to 7/5.1d. per box, while the difference (2/5.7d.) indicated that enjoyed by the tinning process. Although it was argued by some that neither was sufficient, the latter proved attractive enough, and "dipperies" were erected depending upon Welsh blackplate.¹

The development of the new industry was retarded by several influences. The political situation was changed by the defeat of the Republicans at the congressional elections shortly after the new duty came into force. Many anticipated a reduction in the tariff, and few were confident enough to invest capital in tinplate manufacture. The first impetus in this direction was actually given partly by those Welsh manufacturers who erected dipperies in the States! In 1892 a Bill was introduced by Mr. Shively containing provisions for the immediate reduction of the duty to the old level, and its complete abolition after 1894. The "stringency" of the money market was also a considerable retarding influence—not

¹ Probably the separation of the two stages at this point, and the survival of "dipperies," or tinhouses, as independent concerns, accounts for the fact that in American reports the two are treated separately, and that when they are found together the factory is regarded as a "mixed works." In this country they are never separate. A "pure" tinplate works contains the two stages, and a "mixed works" in the Welsh tinplate industry is one which also includes melting furnaces and a bar mill, in which the tinplate bar is manufactured. The difference in classification between the two countries may easily lead the unwary reader astray. Probably many of the "obsolete" factories purchased by the Tinplate Trust in 1898 were merely dipperies (See p. 91.) For the first two years blackplate could apparently be imported more cheaply than it could be manufactured in America. And, until the relative amounts of protection were altered by the Wilson Act, the growth of the American industry was mainly in the form of dipperies.

only upon potential manufacturers, but also upon tinplate merchants and consumers—until, by the repeal of the Sherman Silver Act in 1893, the financial situation was eased. Again, when the duty came into operation, the price of steel was exceedingly high, so that, as already indicated, with that high price prevailing the duty upon imported blackplate was too low. Finally, the method of tinning then in use necessitated the employment of women and boys, as well as highly skilled workmen. It will be shown that considerable changes took place in all these directions, and that the subsequent rapid growth of the industry was entirely due to such changes.

The tinplate duty proved a considerable hardship to consumers. It has already been shown that the boom created by the mere anticipation of the duty raised prices approximately a dollar per box, and seriously affected the quality of the product at that time. Naturally the characteristic price under the new conditions was not lower than that prevailing during the boom. And all the United States industries employing tinplate as raw material suffered. For several years before 1888 prices had steadily fallen, and new uses for the plates had been discovered. But the subsequent increase in prices led to the employment of substitutes wherever possible, and the consumption of tinplate diminished. Glass bottles, wooden boxes and papier-maché were used to preserve and pack goods. Sheet-iron and galvanised sheets, which had been displaced by terneplates for roofing purposes, were now reintroduced. A revolution also took place with regard to the quality of plate employed. A general movement was discernible for saving part of the duty (which varied with the weight) by using the lightest possible plate, and until the results of experiments in this direction were known American demand was materially affected.

It is hardly necessary to state that the canning industries suffered heavily from the increase in duty. Even if they had been able to transfer a considerable proportion of the tax directly to the American consuming

public, demand would have been affected to some degree. But, as will be shown later, they were not able to command higher prices. In foreign countries competition grew keener in more than one direction. The position of Australian, New Zealand, South American and other exporters of canned goods was strengthened. Russia and Burmah were better able to compete for the petroleum markets of the east. This may seem strange at first. One would expect that the McKinley Act would have even proved a blessing to the exporters of canned goods, who were entitled to a rebate of 99 per cent. of the duty. For the price, exclusive of duty, prevailing after the imposition of the tariff was lower than that prevailing in 1889; in other words, the price of the imported article was not raised by the full amount of the tax. But even if the full rebate had been paid promptly in all cases, this expectation would have been only partly realised. For, since Welsh prices to *all* purchasers would be lower, the benefit would not be confined to American buyers. But the drawbacks of the rebate system were so serious that complaints from consumers were frequent.

In the first place, no rebate was allowed on small orders. "There is a provision which entitles a manufacturer who exports under a single order manufactured goods made from imported raw material in so large a quantity that the duty on the raw material entering into that order amounts to \$50 or more, a rebate of 99 per cent. On smaller shipments no drawback at all is allowed. I am not entitled to rebate on any foreign shipments unless the order is worth about \$400. Now, what foreign jobber wants 400 dollars' worth of one kind of dinner-pails at once?" Again, the tax paid upon that part of the plate wasted in the process of conversion into cans and pails and various utensils was not refunded. And since such waste is in many cases a considerable proportion of the whole,¹ the actual rebate was much less than 99 per

¹ In one case quoted by a consumer it amounted to nearly one-half. But this was obviously exceptional. Nevertheless, it was always a considerable factor—a rough guess would be 20 per cent.

cent. of the duty. Finally, the rebate could not be obtained without considerable expense.¹ Consequently, little relief was afforded the small exporter. And one of the incidental results of the limitation of rebate was the elimination of this class, and the concentration of the export trade. A few large exporting firms were substituted for the numerous "jobbers" who had previously controlled exportation. Large firms, such as the Standard Oil Company, probably benefited from the duty. Since they enjoyed the rebate they were practically as well off as they had ever been. Prices (of re-exported plates) to them were lower than at any period in the past. And exports of plates to the States for some time after July 1, 1891, were probably in fulfilment of orders from this class.

The general conclusion seems to be as follows: For a time the tariff, even combined with a rebate, proved a hardship to those engaged in trades involving the re-export of tinplate in various forms. In the long run the effect was quite different. All the exports enjoyed a rebate equal in practice to (say) 80 per cent. of the duty. Moreover, the ultimate price in the States was lower than the original price plus the duty, for the change in the duty caused a heavy fall in Welsh prices. If such a fall was greater than 20 per cent. of the duty, the net result was a gain to the re-exporter, if cost of production alone be considered. But they did not gain relatively to competitors in the foreign markets. More than this it is

When trade revived in Wales after 1898 circular plates, etc., were sent to the Continent. It proved economical to send plates so prepared for further manipulation, partly because a considerable portion of the duty which would otherwise be levied was saved, and partly because carriage on waste was saved

¹ Assuming the incidence of a tax to rest wholly upon the consumers, and prices to remain constant, exclusive of the duty, before and after its imposition, a rebate even of 100 per cent. does not fully compensate the recipient. For he loses the use of the capital during the interval between the advance and repayment of the money. The loss, which is roughly indicated by the permanent loss of interest upon the sum advanced as duty upon the average stock of raw material held in reserve, is so trifling that it is of no practical importance.

impossible to say, for the full effects of the tax upon Welsh prices cannot be estimated with close approximation to accuracy. This naturally leads to a discussion of the incidence of the McKinley duty.

Although it is customary to draw a sharp distinction between the "incidence" and the "effects" of a tax, the meaning given here to the word "incidence" is wide enough to include some of the "effects" of the duty. For the somewhat remote influences and indirect reactions of the "effects" upon the cost of production are so important that they demand consideration even in the treatment of incidence. Indeed, an examination of the problem in relation to this industry provides strong evidence in support of the view that the distinction between the two is purely arbitrary.

The amount of the import duty paid by the consumer is also the measure of the protection afforded the home manufacturer. The incidence of a tax can only be traced with any approximation to exactness provided either that the industry was in a normal state before and after its imposition (apart from the effects of the tax itself), or that the exact measure of the disturbing influences is known. In the former case the incidence would be indicated by the difference in the prices characteristic of the periods before and after the imposition of the duty. Although use has frequently been made of this method, it cannot be justified in this case. It would have been an easier task to measure the incidence of the McKinley tariff if it had come into force when the Act was passed. But the excited state of the market from October to July, and the subsequent depression—both the results of postponing the operation of the duty—as well as the abnormal condition of the American money market, make it quite impossible to determine the distribution of the tax among Welsh producers and American consumers. The prices which should be compared, therefore, are not those prevailing before and after the imposition of the duty, but rather the latter and that which would have prevailed if the duty had not been imposed. It will be evident from

the following considerations that the last of these cannot be estimated with sufficient exactness to be of practical use.

It is obvious that the general result in Wales was increased competition for a restricted market, and lower prices. Increased competition may be due to one (or more than one) of three immediate causes. (1) The number of mills and factories in operation may be increased while demand remains constant. During the boom of 1890-91 the producing capacity in the Welsh industry was enormously increased, so that even if demand had returned to its former level serious over-production would have resulted. Since the boom was an immediate effect of the McKinley Act, its results should be included in estimating the incidence of the tax. (2) The output per mill may be increased by improvements in the methods of manufacture. Such improvements were introduced into many Welsh factories during the three years of operation of the duty. To what extent this was due to such depression as was caused by the contraction of the American market it is impossible to say. (3) The demand may be reduced while producing capacity remains constant. Obviously the demand from America suffered considerably in consequence of the rise in price created by the duty. But an examination of the general industrial situation will show that depression was inevitable, and that the McKinley tariff accelerated and intensified such depression. It is impossible, further, to separate the effects of the general and particular causes of depression, and to indicate the extent to which each contributed to technological progress.

Again, the effects upon markets other than the American cannot be neglected. Assume the exports to the United States to be one-half the total Welsh production of tinplate, the price before the imposition of a duty to be 15s. per box, and the price during the operation of the duty of (say) 4s. per box to be 14s. in Wales and 18s. in America (cost of transport, etc., neglected). It would seem that the incidence is shared between the manufacturers (1s.) and the American consumers (3s.). But this

is not all. Although the tax is placed upon imports into the States only, the price of all Welsh plates (of the same grade) is reduced by 1s. Consequently those manufacturers who sold in markets other than the American also suffered from the duty, while consumers in other countries benefited. The tariff thus injured the small American exporter of canned goods in two ways, by raising the price of the raw material to him and reducing it to his rival.

Mr. Michael Herbert, First Secretary to the British Legation at Washington, in a report issued in 1893, traced the incidence of the McKinley duty in the following manner : "It will be seen from these tables that the price of tinplates began to rise after the month of May, 1890, just before it became evident that the McKinley Bill would pass. The price during that month was \$4.35 per box. The price at present is about \$5.30, showing a rise of 95 cents per box. In May, 1890, the price was 13s. per box in Liverpool. In August, 1892, it was 12s. per box, a fall of 1s., or about 25 $\frac{1}{2}$ cents, caused by the decline in the price of steel bars. The American consumer has therefore to pay \$1.19 $\frac{1}{2}$ per box more than he would have had to pay if there had been no McKinley tariff. The old tax was \$1.8 per box, which added to \$1.19 $\frac{1}{2}$ makes \$2.27 $\frac{1}{2}$ which the American tariff has increased the cost of tinplates." Mr. Herbert here compares two periods during which trade in Wales was not in a normal condition. Moreover, the fall in the prices of Welsh tinplate bar was mainly the result, not the cause, of the fall in prices of tinplate. It is therefore incorrect to make full allowance for it in estimating the effects of the tax. To say that almost all the tax was borne by the American consumer is obviously an exaggeration, for prices fell in Wales, as a direct result of the tax, far below the level characteristic of the period ending with the boom of 1890.

In the building trades of America the tax was partly evaded by the employment of galvanised and steel-sheets instead of terneplates for roofing. In the canning industries prices did not rise, and it would seem at first that

growers, packers, etc., bore that part of the tax which was paid in America. But such was not the case. An over-supply of canned goods existed on the market, and if the duty had not been imposed, probably prices would have fallen. To the extent that potential over-supply would have reduced prices the tax was transferred to the consumers. These vague general statements are all that available data permit.

Before the growth of the American tinplate industry under the shelter of the Wilson and Dingley duties is examined, a clause relating to tin in the McKinley Act calls for comment. The clause runs as follows: "On and after July 1, 1893, there shall be imposed and paid upon cassiterite, or black oxide of tin, and upon bar-tin, block-tin and pig-tin a duty of 4 cents per one pound. Provided, that unless it shall be made to appear to the satisfaction of the President of the United States (who shall make known the fact by proclamation), that the product of the mines of the United States shall have exceeded 5,000 tons of cassiterite, bar-tin, block-tin and pig-tin in any one year prior to July 1, 1895, then all imported cassiterite, bar-tin, block-tin and pig-tin shall after July 1, 1895, be admitted free of duty."

Tin was discovered in the Black Hills of Dakota about 1887. Abundant supplies of ore, containing about 3 per cent. of tin, were said to exist near the surface. Since Cornish ore was stated to contain an average of but 2 per cent., and could only be obtained at a depth of about 1,000 yards, the difference in favour of America would have been considerable if expectations had been realised. And the discovery of native ore supplied a useful argument in support of the duty on tinplate. But before the duty came into force the three tin mines which were opened in different parts of America had been practically closed. A petition against the duty from the tinplate manufacturers early in 1893 failed in its object—the tax was levied for the period stipulated in the Act and then automatically disappeared. The following table clearly indicates the effect of the duty:—

IMPORTS OF TIN INTO UNITED STATES

Year ending June 30	FREE		DUTIABLE	
	Quantity lbs	Value Dollars	Quantity lbs	Value Dollars
1893	61,075,929	12,358,999	—	—
1894	—	—	16,785,362	2,640,770
1895	40,484,183	5,713,300	7,147,600	1,074,124
1896	49,952,983	6,761,716	—	—
1897	50,460,123	6,535,852	—	—

In anticipation of the duty prices were raised about £3 per ton in 1893, and imports were enormously increased. The following year, in spite of increased demand for tinplate manufacture, imports were enormously reduced, for two reasons. A considerable stock remained on hand from the previous year, and consumers, assured of the early abolition of the duty, purchased only sufficient for immediate requirements. After the abolition of the duty the import trade reverted to its normal state.

The growth of the American tinplate industry after 1892 was rapid and continuous, and the proportion of tinplate to terneplate was steadily raised. Until 1894 blackplate for tinning purposes was imported from Wales, partly because the high price of steel prevented profitable manufacture in the States with the existing duty, and partly because the American rolling plant could not be adapted at once to the production of blackplate of the requisite quality and gauge. The relative, as well as the absolute, amounts of protection to blackplate and tinplate were changed by the Wilson Tariff Act. By this Act the duty upon tinplate was reduced to 1.2 cents per pound, and the duties on blackplate were raised to 1.1 cents (rough blackplate) and 1.22 cents (plates ready for tinning). Thus the duty upon that form of blackplate which had been imported from Wales was raised above that upon the finished article, and if the tinplate industry was to grow, it could only do so by the erection of rolling mills in addition to tinhouses. Imports of blackplate practically ceased after 1895.

The Wilson duty, which came into force on August 28, 1894, was described as a "revenue duty"; at the same

time, it was high enough "to permit any existing mill to live and flourish." Obviously it could not succeed in both objects at the same time. If it proved sufficient to protect existing manufacturers, there was every reason for believing that the industry would grow. And if it grew, imports would naturally cease and the revenue vanish. The reduction of the duty was followed by a remarkable increase in production. A large number of new factories, containing rolling mills as well as tinning departments, were erected, and by the end of 1896 practically all the plates of ordinary grades required for consumption east of the Rocky Mountains were manufactured in the States.

Several causes contributed to the rapid development of the industry in spite of an unfavourable change in the tariff. (1) The period of national apprenticeship had come to an end. Workmen had been trained, and machinery had been discovered which enabled much female labour to be dispensed with. Moreover, in January, 1895, the wage rates were reduced 12½ per cent. Nor was the daily output restricted, as in Wales. In short, the human difficulties had been largely overcome. (2) All uncertainty regarding the tariff was removed by the Wilson Act. While the high McKinley duty remained in force and the democrats were in office, the investment of capital in tinplate manufacture involved great risk, for the tariff might at any time be abolished. It was practically certain that the new duty of 1.2 cents, which proved to be sufficiently protective, would not be further reduced. (3) Money for investment was more plentiful after 1893 than in previous years.

(4) Far the most important cause was the fall in the prices of steel. From approximately £5 per ton in 1890 billets fell to about £4 in 1894, and to an average price of £3 6s. 4d. for the following year. It was estimated that by this time the fall in the price of steel alone counterbalanced the reduction in the duty. The decline in steel prices was due partly to the severe depression prevailing during these years, and partly to economies effected in

manufacture and transport. Freight rates on lakes, canals and rivers were reduced, shipping facilities were increased, and railway rates fell. Consequently, iron ore and fuel could be assembled near the furnaces at lower costs. New methods of production were introduced, by which fuel was economised, labour displaced, etc. Finally, wages were reduced in many branches of the steel industry.

The following tables indicate the rapidity with which the American industry developed and the extent to which Welsh manufacturers suffered:—

Year	Exports to U S A Tons	Fiscal Year	Production in America Million pounds
1895	210,545	1894-5	193·8
1896	119,179	1895-6	307·2
1897	63,851	1896-7	447·0
1898	66,775	1897-8	732·3
		1898-9	808·4

In 1896 a curious Act was passed, by which a drawback of 99 per cent. of the duty on imported blackplate was allowed upon exports of tinplate manufactured in the States from foreign blackplate. The object seems to have been to capture the re-export trade in tinplate.¹ Naturally this Act had no effect upon the trade. Imports of blackplate were nominal, for the duty imposed by the Wilson Act provided effective protection. Even if such plates had been imported it would probably have been found that the protection afforded the tinning process was inadequate.

In July, 1897, the Dingley Tariff Act was passed, by which the duty on imported tinplate was raised from 1.2 to 1.5 cents per pound. At that time imports from Wales were still considerable. These consisted of (a) plates of special qualities which American manufacturers had not yet succeeded in producing for themselves; (b) plates sent to Pacific ports and probably intended for consumption west of the Rocky Mountains. The Wilson duty, while providing adequate protection in the eastern markets, was not sufficient to counterbalance the heavy

¹ Tinplate made in America from imported blackplate was returned as American-manufactured tinplate

railway charges across the continent. It is true that even the western market had begun to receive attention long before the Dingley Act was passed, but it seems likely that plates were sent there at a slight loss to relieve an over-stocked market. It is probable, however, that even if the duty had not been raised in July, the Pacific market would have been captured from the Welsh manufacturers. For freight rates from Pittsburg to San Francisco fell nearly 2s. per box in the spring—a more important factor than the increase in duty, which only amounted to about 1s. 3d. per box. But the double advantage enabled American manufacturers to capture the market with ease, as the following table indicates; and subsequent exports to Pacific ports consisted of plates intended for re-export, upon which the rebate was paid.

EXPORTS TO PACIFIC PORTS

Year	Tons
1895	25,915
1896	19,183
1897	9,074
1898	3,011

(c) Plates intended for re-export. These formed the bulk of imports from Wales after 1896, and remained unaffected by the new duty. In the first draft of the Dingley Bill it was proposed to abolish the rebate upon re-exports. While it seemed necessary to the canning industries during the early years, when American production was insufficient to satisfy the total demand, and the cost of manufacture remained high, it was now thought to be superfluous. But a strong protest was made by the oil companies, who bought about three-quarters of the imports of such plates. These companies, who were subject to keen competition from Russia in the foreign markets, threatened to ship oil "in bulk," and manufacture cans at foreign ports which admitted tinplate duty free, or to make oil cans in bonded warehouses erected for the purposes. But either method would have proved too expensive to the smaller firms, whose export trade might

have been ruined by the proposed abolition of the drawback. In the end, their opposition prevailed and the rebate system was retained.

Thus the new duty did little more than provide a slight stimulus to growth. Nor was this stimulus needed, for the industry was already growing with unusual rapidity. By the end of 1896 it had been established upon so large and secure a foundation that "no passing derangements could be powerful enough to injure it." In 1897 the producing capacity was increased by about one-half, while the advance made during the following year was no less remarkable. When the Tinplate Trust was formed, practically only rebate orders were supplied from Wales.

Until 1896 prices of American tinplates were governed by those of imported plates, and were fixed at a point just below the latter (duty paid).¹ But during this year internal competition began to take effect, and temporary reductions in prices took place. Consequently an informal price agreement was made, which resulted in a rise for a time. At the beginning of the next year the agreement was disregarded, and the margin between the prices of American

¹ The following statistics of prices are quoted by Professor Hermann Levy. Tables which I prepared indicate monthly averages, and are in substantial agreement with these. But neither set does more than provide a rough index of changes.

ANNUAL AVERAGE PRICES
of 100 lb I C coke, 14 x 20 (Wales 108 lb. U.S.A. 100 lb.)

Year	New York	England	Duty	Difference
	\$	\$	\$	\$
1890	4.43	3.61	[1.00	0.82
1891	4.93	3.29	1.00—2.20	1.64
1892	4.90	2.76	.2.20	2.14
1893	4.97	2.66	2.20	2.31
1894	4.52	2.31	2.20—1.20]	2.21
1895	3.44	2.14	1.20	1.30
1896	3.43	2.09	1.20	1.34
1897	3.18	2.20	.1.20—1.50	0.98
1898	2.85	2.21	1.50	0.64
1899	4.19	2.97	...1.50	1.22
1900	4.67	3.38	1.50	1.29
1901	4.19	2.98	1.50	1.21
1902	4.12	2.91	1.50	1.21
1903	3.94	2.66	1.50	1.28
1904	3.60	—	—	—

and imported plates (duty paid) once more grew wider. And when this occurred it was evidently unprofitable to import plates intended for home consumption. The fall in American prices is not explained by the reduction in the costs of raw material. For, in the first place, such reduction would have had no effect while American tinplate production remained insufficient to supply all the plates required for home consumption; and, in the second place, the variations in prices of raw materials and the finished article did not correspond. The fall in tinplate prices was obviously due to over-production in America.¹

The main purpose of this section of the present chapter has been to show the effects of the McKinley and subsequent tariffs upon the development of the American industry, rather than to discuss the problems of organisation created by that development. But the changes in organisation between 1898 and 1903 were so important that, especially in view of recent developments in the control of the Welsh industry, they claim some attention at this stage.

As the result of the changes in the relative prices of steel in America and Wales, produced by improvements in the methods of manufacture and facilities for transport, the Wilson duty provided sufficient protection for American tinplate manufacturers. An increase in the duty, by enlarging the possible margin between cost and price, inevitably resulted in increased production. The addition of 3 cents per pound to the duty meant further protection to the extent of 1*s.* 3*d.* per base box. An additional incentive to the erection of new factories lay in the fact that a large proportion of the existing works were merely tinhouses (or dippers) built several years before, in which the cost of manufacture was relatively high. Although they were slow to give way, it was obvious that these would need to be replaced. Thus the tinplate industry at this time was unusually attractive. It proved, indeed, too attractive. As already stated, a

¹ Over-supply caused a fall in prices as early as 1895; but this was due to a fall in demand, through the failure of the fruit crop

depression of prices, caused by over-production, set in soon after 1896, and many manufacturers suffered considerable loss. Probably the majority of these were owners of dippersies. But they held on, and by doing so prevented a recovery.

The contrast between the actual conditions and the possibilities created by the Dingley tariff led to the formation, in December, 1898, of a monopolistic combination entitled the American Tinplate Company. Nearly all the existing firms were bought up by the Trust, which embraced thirty-eight firms.¹ The sole object of the combination was to substitute complete monopoly for unregulated competition. About one-half the factories were in the State of Pennsylvania, more than a quarter in Ohio, and about one-half the remainder in Indiana. Many of the trusts formed during that remarkable period, 1898-1900, when the iron and steel industries in the States were entirely reorganised, aimed at reducing cost of production. In these the movement towards "vertical integration"—*i.e.*, the control of two or more stages of production by one company—was more evident than that towards a monopoly of any one stage. The main economies of vertical integration consisted of the utilisation of by-products (*e.g.*, blast-furnace gas), the saving of fuel for re-heating, and the better distribution of orders, reducing the labour and time spent in moving and handling raw material. But economies of this character were entirely absent from a "horizontal combination"—*i.e.*, unified control of similar firms engaged in the same process of manufacture—such as the American Tinplate Company, and the American Sheet-Steel Company. The main early characteristic of the industries subsequently controlled by these trusts was the absence of integration. And the economies resulting from the formation of horizontal combinations were of minor importance. Each of these trusts aimed, first and last, at controlling prices by eliminating competition. The Tinplate Trust succeeded admirably at first, and became the most completely

¹ One was added shortly afterwards

monopolistic of the group of a dozen consolidations afterwards taken over by the United States Steel Corporation. But, although there was no formal process of integration in the tinplate industry, practically the same result was achieved in another way.

The consolidations of the period fall into two groups—the primary and the secondary. The former consisted of the Carnegie, National (1899), and Federal Steel Companies, all of which were engaged mainly in the earlier stages of manufacture, such as the production of pig-iron, and the three trusts in that group were often in active competition with each other. The secondary group, which included the Tinplate Trust (1898), the American Sheet Steel Company (1900), and the American Steel Hoop Company (1899), consisted of trusts engaged mainly in the later stages of manufacture. And little or no competition existed between them.¹ The National, Tinplate, Sheet Steel, and Steel Hoop Consolidations were all organised by Judge Moore, and were known as the "Moore group." Through him they were affiliated, and a considerable degree of common management was secured, and together they provided a loose form of integration. The National Company supplied the Tinplate and Sheet Steel trusts with tinplate and sheet bars.

The policy of the Tinplate Trust was consistent with the object of its formation. It refused to supply independent tinhouse owners with raw material, and apparently made agreements with other firms to do likewise. Most of the independent makers capitulated, and their factories were taken over by the trust; but some remained outside, and erected rolling mills. This policy was carried a stage further. Agreements were made with makers of tinplate machinery to boycott "outsiders."

¹ Since terneplates and steel sheets are partial substitutes, there was probably some indirect competition between the first two. Moreover, the Sheet Company probably competed with the Tinplate Company in so far as the latter made blackplate for the market. But that is merely a statement of probability, and is not based upon direct evidence.

And so necessary was the favour of the trust to the engineering firms that the boycott was largely successful for a time. Some of the factories under the control of the company were obsolete dippersies, and were dismantled. Thus, while in 1899 279 mills were at work or ready for work, the number had been reduced to 264 in 1903, in spite of the erection of many new mills.

The object of the consolidation was the control of prices. In January, 1899, the price of a base box was \$3; in September it had been raised to \$4.65. The wide margin created by the Dingley duty was utilised to the fullest possible extent, and prices were once more determined by those prevailing in Wales, and fixed at a point just below the price of the corresponding imported plate, duty paid. It was argued that the rise in prices was due to an increase in the cost of raw material and in wages. But the cost of material did not advance relatively to the Welsh cost; steel prices rose both in Wales and in America. Wages, too, were increased considerably in Wales by the re-establishment of the standard rate of 1874.¹ The rise in prices of tinplate at this time was mainly due to monopolistic control of a commodity the demand for which was fairly inelastic, even at the high price level prevailing in America. Naturally, profits were appreciably increased. In 1898 the aggregate profits of the competing firms amounted (approximately) to \$2,000,000 (11 per cent. of the preferred stock of the trust afterwards formed); profits amounting approximately to 3.6 million dollars in 1899, and to 5.75 million dollars in 1900, were enjoyed by the trust.

But increased profits were naturally followed by competition from outside. New factories were erected, and the monopoly of the trust was threatened. At first these were bought up, but afterwards they became too numerous, and during the next ten years, as will be shown later, the proportion of the total supply produced by the trust steadily diminished.

How much improvement in prices and increase in

¹ See next section

profits were expected from a monopoly is suggested by the extent to which the Tinplate Trust was "over-capitalised" at its formation. The aggregate value in 1901 of the tangible assets of the thirty-eight firms taken over by the company three years before amounted approximately to \$18,000,000. Of this sum \$4,500,000 was working capital, so that \$13,825,000 represented the approximate value of the plants.¹ The authorised capital of the trust amounted to \$50,000,000,² of which \$20,000,000 was preferred stock, and \$30,000,000 common stock. Two millions of each kind of stock were retained in the treasury, and the remainder was actually issued. Shortly afterwards, \$325,000 preferred stock were further issued to acquire the plant of the Canonsbury Iron and Steel Company.

Thus the preferred stock (\$18,325,000) represented the value of the physical assets, while there was nothing tangible behind the common stock.

When the trust was formed a "cash option price" was fixed for the plant of each of the constituent firms. The owner (or owners) was given two alternatives. He could either be paid the sum in cash, or be given preferred stock to that amount together with a "bonus" of an equivalent amount of common stock. Thus, in the latter case, the owner of a plant worth \$3,000,000 was given stock amounting to \$6,000,000, one half "preferred," the other "common." This accounts for \$36,000,000 of the authorised capital of the trust. \$4,000,000, as already indicated, was not issued. The remaining \$10,000,000 constituted the payment to the promoter (Moore) for his services (including expenses). All the common stock was therefore "watered." It represented the capitalised value of the anticipated "monopoly

¹ I purposely refrain from a discussion of the meaning of "tangible assets," "the value of a plant," "over-capitalisation," "stock-watering," etc., because it opens up too big a question to be dealt with in a monograph of this character. Although doubting the validity of such terms, and sceptical of the value generally attributed to them, I have employed them in the commonly accepted sense.

² Together with \$273,000 underlying bonds

profits," *i.e.*, the addition to profits resulting from the elimination of competition. The average market price for 1899-1900 of the (\$100) preferred stock was \$84.77, while that of the common stock for the same period was \$34.77. Thus the real payment to the owners of the separate factories was roughly 20 per cent. above the stated value of the "tangible assets."

When, in 1901, the Tinplate Trust was taken over by the United States Steel Corporation, the latter exchanged \$125 Corporation preferred stock for every \$100 Tinplate Trust preferred stock. And for every \$100 common stock the shareholder in the trust was given \$20 preferred stock, together with \$125 common stock. Consequently, \$22,906,250 Corporation preferred stock was substituted for the \$18,325,000 Tinplate Trust preferred stock, while \$5,599,000 Corporation preferred stock plus \$34,993,750 common stock was substituted for the \$27,995,000 trust common stock issued. In other words, the capital of the tinplate company was raised from \$50,325,000 to approximately \$63,500,000.

The increase in the nominal capital at the time of transference probably represents the appropriate share of the capital value of the anticipated increase in profits resulting from the elimination of competition (mainly among the members of the "primary" group), as well as from the reduction in cost in some branches of manufacture. But, in point of fact, little could be expected in this direction from the tinplate manufacturing section. For the monopoly was previously as complete as it was likely to be in the future, while the minor economies resulting from vertical integration were probably already secured by the common control existing in the Moore group.

Two years later (1903) the Sheet Steel and Tinplate Companies were amalgamated to form the American Sheet and Tinplate Company. That both had been enormously over-capitalised is evidenced by the fact that when this "intercompany consolidation" was effected, the capital of the new company remained the same as that of the

Sheet Steel Company, viz., \$52,000,000.¹ The object of this consolidation was to secure co-operation and better co-ordination of the mills. It will be shown in a later chapter that the two industries are practically the same in their essentials, present almost identical problems, and call for the same method of control and character of organisation in the rolling mills.

The extent to which the Steel Corporation has succeeded in retaining a monopoly of tinplate production is shown in the following tables:—²

	BLACKPLATE PRODUCED IN TIN MILLS		COATED TIN MILLS PRODUCTS	
	U S Steel Corporation	Independent Firms	U S Steel Corporation	Independent Firms
1901	79·8	20·2	73·1	26·9
1902	70·7	29·3	71·4	28·6
1903	77·6	22·4	76·4	23·6
1904	71·5	28·5	71·4	28·6
1905	67·9	32·1	71·3	28·7
1906	70·4	29·6	73·5	26·5
1907	69·1	30·9	72·6	27·4
1908	67·6	32·4	71·1	28·9
1909	60·0	40·0	61·9	38·1
1910	52·9	47·1	61·1	38·9

It is evident from these figures that the competition of independent firms is a factor to be reckoned with. Naturally the success of competitors depends upon the ease with which raw material can be obtained, for a tinplate factory can be erected with relatively little expenditure of capital. It is evident, then, that the failure of the Corporation to

¹ \$26,000,000 preferred stock and the same amount of common stock, \$2,000,000 being underlying bonds. Of this \$49,000,000 had been issued. The capital of the Tinplate Company was reduced to the nominal figure, \$25,000.

² Since blackplate is really the tinplate in process of formation, the difference between the degrees of competition in the two products seems remarkable. But the explanation is probably to be found in the fact that not all the blackplates produced were tinned, while some of the tin or terneplates were made from plates rolled in the sheet mills, which at one time were under the control of the Sheet Steel Company.

maintain a complete monopoly of tinplate manufacture is due to previous failure to create a monopoly in the production of semi-manufactured steel products, such as pig-iron and tinplate bar. Had it succeeded in the latter it would have succeeded also in the former.¹

The final point for consideration is whether the experiment in America may be regarded as a successful application of the "infant industry" argument for protection. Until 1911 the rebate trade remained in the hands of South Wales manufacturers, but in that year it was diverted to the United States. It is difficult to say whether the loss of this market will prove permanent. In 1911 Welsh prices were exceedingly high, and orders from other countries were not only sufficient to keep all the Welsh mills fully employed, but also more remunerative than those coming from the United States and Canada. Consequently, British manufacturers made no serious attempt to retain the American market.

At this time the "book cost"² to the United States Steel Corporation of manufacturing tinplate in America was \$3.18, so that the capture of this market by the American manufacturers seems to have been effected without much loss. There appears to be little difference between the costs of production in the two countries.

If American manufacturers are able to compete successfully for the re-export trade, it follows that the duty upon tinplate is unnecessary, and that the recent reduction of the tariff to 15 per cent. *ad valorem* will have no effect upon the trade. It is probably true that the revision will have no influence beyond restricting the power over price of a monopolistic combination in the States. It is likely, moreover, that the abolition of the existing duty would

¹ This self-evident proposition is strictly relevant to a subject to be discussed in the chapter dealing with the relations of steel and tinplate manufacture in Wales.

² i.e., the cost entered in the accounts of the Corporation. It includes intermediate profits, i.e., a percentage of cost was added at each stage in the process of converting iron ore into the final product. This addition, which was considerable in the early stages, represented the book profit for that stage.

not materially affect American production. For the moment it might enable Welsh manufacturers, now selling at low prices upon an over-stocked market, to compete for orders from the Pacific market, just as they are now succeeding in recapturing part of the rebate trade and recovering the Canadian market. But such a demand from America, by stiffening market prices everywhere, would check its own expansion, and ultimately it might again disappear. Until it is shown that the Welsh manufacturers, under normal conditions, are able to compete successfully for the rebate and Canadian orders, it is difficult to justify the existing duty.

But assuming that the American industry still needs moderate protection—or in other words, that the consumers in the United States must pay higher prices than they would pay if the duty were abolished—it does not necessarily follow that the McKinley duty was not justified on the ground already indicated. On the contrary, it may be plausibly argued that it has proved to be an entirely successful application of the principle of protecting an infant industry *in a country where a protective system prevails*. For the cost of production has been enormously reduced in both countries during the past fourteen years, and is now lower in America than the price, duty paid, in 1889. If the reduction in cost has been entirely due to the protective duties, and would not have been effected without them, the case of the protectionists has been proved. With the existing American price it is necessary to compare, not the price now ruling in Wales, but the price which would probably be ruling if the protective duties had never been imposed. If the conclusion is that the latter price (with the addition of that revenue duty of one cent per pound which was operative until 1891) would have been higher than the prevailing price in America, the results have justified the policy. The answer depends, therefore, upon the extent to which the fall in cost of manufacture has been due to the protective duties.

That the new American policy contributed much to

industrial change cannot be denied. Masters and workmen in Wales had for many years shown themselves to be extremely conservative in business matters. The workmen's associations adopted a short-sighted policy in limiting output and preventing the introduction of new machinery. As early as 1887 new methods of production were devised which, through the opposition of the workmen, were not utilised for several years. Consequently the cost of manufacture remained relatively high. Employers, too, were blameworthy. They paid little attention to the variety of needs of their best customers, complaints from America were frequent, and much irritation was felt. A strong incentive to the adoption of improvements and to adaptation to changing needs was obviously wanting. And this was provided by the creation of a competing industry in the United States. Thus it may be concluded that although periodic over-production and keen internal competition would ultimately have compelled the introduction of new machinery and the adoption of more modern business methods, the loss of the largest market hastened the day of change.

Granted that events have completely justified the action of the Republicans in 1890, to generalise from this instance would be dangerous. For the new manufacturers were more fortunate than had been anticipated by the most optimistic protectionist. The relative price of steel in America fell, partly through unexpected improvements in the methods of production of steel, which lessened the direct importance of labour. If the McKinley duty had been established early in the eighties it would probably have proved a failure. Moreover, to argue for a general protective system or for a higher degree of general protection from an example of this character is to be guilty of the "fallacy of the particular instance." For a successful application of the "infant industry" argument implies a relatively high protective duty in aid of that industry; and a relatively high duty in one case involves a relatively low duty in most other cases.

Finally, it may be observed that if the United States

had early established a system of free imports the tinplate industry would have been created at least as soon as it was under protection; and if protective duties were now abolished, the Welsh tinplate industry would soon suffer in competition with its American rival. The prosperity of the Welsh industry depends upon the continued existence of protection in the United States. For if, in spite of the difference in the general level of prices in the two countries, the money costs of production differ so little, it is obvious that the net amount of human energy employed in tinplate manufacture is much lower in America than in Wales. The abolition of protection in the United States would result in a fall in the general level of prices, or, in other words, in the adoption of the same "measure of value" as in this country. And such a fall in prices would emphasise the superiority of America for the manufacture of tinplate, and would probably be followed by a rapid growth of the industry at the expense of our own.

(b) THE EFFECTS OF AMERICAN TARIFFS UPON THE
WELSH INDUSTRY

The period of seven years following the imposition of the McKinley duty was one of intense and almost unrelied depression in the tinplate industry. A number of firms failed and many tradesmen and small merchants engaged in dependent trades were ruined. Since the depression began almost at the same time as the duty came into operation, it is often supposed that Welsh manufacturers were at once deprived of their chief market; and it is as commonly implied that a sufficing American industry suddenly sprang into being and supplied all the plates required for home consumption. But enough has already been written to indicate the error of this view. The Welsh manufacturer was but slowly driven from the western market; only during the latter half of the period did American production affect exports to the extent

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commonly supposed, while even then the demand from other countries was increasing steadily, and promised soon to compensate fully for the loss of the American market. Thus it is only partly true to say that the depression of the nineties was due to American competition.

But although the competition of the new rival was almost a negligible factor for a time, the McKinley Act did immediately contribute much to the depression by creating a condition of things which inevitably resulted in serious over-investment of capital by manufacturers, and occasional reluctance on the part of customers. Further analysis shows, however, that the intensity of the depression was also a function of general industrial and financial conditions; for the financial situation in the United States until the repeal of the Sherman Silver Act in 1893, together with the depression of trade throughout the world of modern industry between 1893 and 1896, undoubtedly affected the tinplate market..

So much attention was devoted to this victim of the American tariff, and so many wild statements were made (on both sides) during the recent discussion of fiscal policies, that no apology is needed for devoting a seemingly disproportionate amount of space to this, the most critical period in the history of the trade. We have already seen that during the boom in the early part of 1891 every effort was made to cope with the American demand, and that other markets were for the time neglected. These received attention after the McKinley duty came into force. Notwithstanding the fact that rebate orders were probably placed for delivery after July, almost sufficient was exported in the twelve months preceding the imposition of the duty to satisfy the probable needs of all consumers for eighteen months.¹ Thus, quite apart from possible American competition, a considerable reduction in demand for the following year was to be expected. Exports, however, did not cease in June; compared with

¹ The exports to U.S.A. during the fiscal year ending June 30, 1891, amounted to 8,846,000 cwts., compared with 5,924,000 cwts. in the previous year.

others the American market remained large. But probably the vast majority of the plates shipped during the remainder of the year were in fulfilment of rebate orders for it was much more profitable to purchase at low prices after June and advance the duty until repayment was made (upon re-exportation) than to purchase at the abnormally high prices ruling during the boom.

The following representative tables indicate the extent to which other countries were neglected, and the effect of the duty upon monthly exports to the States.

1891	To U.S.A.	Russia	Continent
	Tons	Tons	Tons
January	283,779	7,893	15,715
February	371,915	28,358	6,006
March	334,047	17,081	5,173
April	400,240	50,892	6,938
May	491,890	47,706	4,844
June	233,379	—	6,098
July	45,295	57,944	21,560
August	34,951	84,350	21,928
September	114,359	58,672	15,489
October	42,688	48,220	31,116
November	104,864	62,544	26,339
December	—	—	—

Thus it is undoubtedly true to say that the immediate cause of the depression was the concentration of demand upon the early part of the year. Prices fell at the end of June from the high level which had for some time prevailed to 13s. 3d.-13s. 6d. per box, but "tinplates were treated as they were no longer made."¹

Anticipating a reaction the manufacturers decided to suspend operations for the month of July, partly to enable stocks to be cleared and prices to recover, and partly to enable repairs to be carried out which had been rendered necessary by the abnormal strain placed upon machine tools during the boom. Many of the factories were idle for three months; but prices of plates remained low, while those of tinplate bar fell in sympathy. Moreover, enforce-

¹ Swansea Metal Exchange Report, June

idleness for so long a period induced a large number of workmen to emigrate to the States.¹

Early in 1892 trade revived a little, but only for a short time, and for the rest of that year and the whole of the following extreme depression prevailed, while prices fell ultimately to approximately half a guinea per box. American consumers employed substitutes for tinplate wherever possible. Moreover, since the duty varied with the weight of the article rather than its value, those who were unable to find suitable substitutes endeavoured to avoid part of the duty by purchasing the lightest possible plates. Experiments were being made to this end, and until the results were known, consumers bought only what was absolutely necessary to meet existing needs. Loanable capital, too, was scarce; and the stringency of the money market undoubtedly affected commerce. Finally, the failure of the American fruit crop in 1892 affected demand from that country, while the South Wales coal strike in the summer of the following year increased the hardship among tinplate workers by further affecting the continuity of employment. But notwithstanding these factors, thanks to increased demand from other foreign countries the total exports were greater in 1892 than in 1888, and not much less in 1893. Probably, too, the low prices ruling, which stimulated consumption in the minor markets abroad, resulted in increased demand at home; so that the total demand for tinplate was probably not less for these two years than for the two years preceding the boom which commenced in 1889. Consequently the depression is not fully explained by the above causes. Undoubtedly it was partly due to the investment of capital

¹ The workmen's leaders objected to a stoppage at this juncture. They argued not only that a period of four or five months would be necessary, but also that to maintain high prices would be to help the Americans in their attempt to establish a competing industry. Moreover, they urged that since they had withdrawn notices to cease work during and in consequence of the boom, they now deserved consideration. An extended period of idleness would cause great hardship, and was unnecessary in view of the fact that a shorter working week for a longer period would achieve the same result. Fortunately, it is not part of our task to reconcile these arguments!

beyond normal requirements. Tinplate mills can be erected quickly and relatively cheaply, and every boom is accompanied by serious over-investment. The enormous number of mills called into being by the concentrated demand still remained and sought employment. It is evident, then, that the postponement of the operation of the duty under the McKinley Act not only failed to provide cheap plates to American consumers, but also intensified in a considerable degree the subsequent depression in South Wales. If the duty had come into force immediately the Act was passed, the new mills would not have been erected, obsolete mills would not have been pressed into service and the attendant evils of the tariff would not have been so serious. Moreover, as already shown, the prices of tinplate in America would not have been much higher.

Welsh manufacturers and workmen had always been exceedingly conservative in their methods. Until the McKinley Act was passed the American market was so secure that no serious attempt was made to seek new customers. And even the best customer was treated in a somewhat cavalier manner. The changed conditions did not at once effect an improvement in this respect, for during the years which we have already examined complaints were made against irregularity of shipments, and non-fulfilment of contracts within the stipulated time. If there had been ample excuse during the boom there was none during the subsequent depression. When an American consumer made contracts directly with the manufacturer rather than purchased through a merchant, he was often compelled to take the risk of the market by placing orders considerably in advance of requirements, and in large quantities.

But so severe was the depression that late in 1892 some of the Welsh manufacturers felt an organised attempt to encourage the use of tinplate to be necessary, and a meeting was held at which a proposal was made to send agents to the East and elsewhere. In the end it was decided to await the results of the American Senate

elections. The manufacturers believed that if the Democrats were successful the Shively Bill would be passed and tinplates placed upon the free list.¹ They argued, moreover, that even with the aid of the existing high duty the attempt to establish a competing industry would not be successful. Considerable and permanent contraction of American demand, in consequence of high prices, was more generally anticipated. This Micawber-like attitude of the employers probably delayed the ultimate recovery of trade.

During 1894 matters grew worse rather than better. The "Iron and Steel Trades Journal," in its review of the year, observes : "The year 1894 was a time of great depression in nearly every department of trade. Considering the combination of untoward events which occurred in the year preceding, and the low range of prices then ruling, it was hoped that the year which has just closed would have a better record than the one preceding, but in this we were doomed again to be disappointed. Following upon the disorganisation of credit caused by the Baring suspension came financial trouble in America, Australia, Italy, and Greece, and this was succeeded by such an over-supply of the principal staple products as led to the prices unprecedented in the history of modern commerce. . . . The war between China and Japan was the latest disturbing element."

The tinplate trade was directly affected by a number of factors. Not only was the competing industry in America growing rapidly, but the canning industries were unusually dull and the building trades inactive. Furthermore, in consequence of the employment of substitutes, the demand for roofing or terneplates steadily diminished. A revival of trade with America was expected after the passing of the Wilson Act, but anticipations were not realised. Exports to that country steadily diminished, our trade with the Pacific ports was lost through the Dingley Act of 1896, and by the end of

¹ But it will now be evident that even the recovery of the American market would not have completely restored prosperity

the following year the American market for plates intended for consumption in that country had been completely lost. The rebate orders alone remained. Since then intermittent orders of the other kind have been placed in this country, but these have always been the result of temporary and accidental causes.

Prices naturally remained low. In September, 1894, they fell to 10s. $7\frac{1}{2}$ d. per box, in December to 10s.; in the following January to 9s. $7\frac{1}{2}$ d., a year later to 9s. 3d., and in the following March (1896) to 9s. $1\frac{1}{2}$ d. Meanwhile cost of production was, for many reasons, reduced. Improved methods were employed in the tinhouse. Various economies were introduced as a result of closer application in management¹—economies which in earlier years received no attention. Prices of raw material fell, and wages were repeatedly reduced. It was estimated that by 1894 the cost of production, based upon the standard rate of wages (which was not generally paid at this time) had been reduced to about 10s. per box in a well-managed factory. It will thus be seen that not until the beginning of 1895 did prices become unremunerative to all manufacturers. But they had probably long fallen below cost to the majority, and by 1896 they were little above prime cost.

The following tables roughly indicate the extent of unemployment at the time of the Government inquiry into the causes of distress (1895) and during the two preceding years of the depression.

¹ One maker observed at this time “It is well known that for the past two years many little economies which were not necessary in the good times of the trade have been practised, such as better management of the stores used in making plates”

REPORT OF THE SELECT COMMITTEE ON DISTRESS FROM WANT
OF EMPLOYMENT, 1895¹

	May 24, 1895		Workmen		From commencement of 1893		
	Mills at work	Mills idle	Em- ployed	Idle	Totally idle	Partially em- ployed	Working
Glamorgan—							
44 Works	145	105	7,250	5,250	2,550	2,700	7,350
250 Mills							
Carmarthen- shire—							
28 Works	97	58	4,850	2,000	2,050	1,650	4,050
155 Mills							
Monmouthshire and Glouces- tershire—							
21 Works	51	58	2,550	2,900	1,950	1,300	2,200
109 Mills							
TOTAL			...	6,550	5,650	13,600	

In a letter from the Mayor of Swansea to the above Committee² it was stated that in the district around Swansea the steel and tinplate trade was "at a perfect standstill, resulting in no less than 4,450 being out of employment; 2,000 labourers and hauliers are also out of employment by reason of the stoppage of the different works."

Great distress prevailed, especially during the exceptionally cold months in the early part of 1896. The workmen's union (which in the best of times enjoyed a membership of only between 8,000 and 9,000) was but a

¹ Not all the operatives are included in the above table; for the total number engaged in the industry was estimated at 30,000. Probably women and young persons were excluded. It is impossible to say. On the other hand, 30,000 was undoubtedly an over-estimate.

² 2nd Report, Appendix 5. Special attention was paid to the tinplate trade as it was "the most clearly defined instance of a large industry suffering from trade depression." 3rd Report

strike society, and normally paid strike benefit only. But a special fund, independent of the general fund, was raised in 1892, and £3,500 was distributed among the unemployed on the basis of 7s. 6d. for each man and 1s. for each child per week. When this had been spent the rules of the society were relaxed, and relief to the amount of £6,500 was distributed. But by the end of 1894 the union funds had been exhausted. No more assistance from this source was possible, and distressed families obtained relief from special local funds.

Attempts of various kinds were made to reduce the loss resulting from low prices. Those producers who regarded the American market as lost suggested, in 1894, a price-list agreement; but to this the majority raised objections. The latter still hoped for the best, and argued that higher prices in this country would react upon American prices and stimulate the growth of a competing industry. It was further stated that some of those who favoured an agreement had already erected factories in America, and would consequently enjoy large profits in that country as a result of the agreement.

The failure of this attempt at combined action led to the formation, early in the following year, of a Board of Control. Although the Board was almost a complete failure, it calls for comment. For, while its object was to control production, the suggestion emanated from the workmen, the initial step was taken by their union, and the Board itself consisted of employers and employed. The Council of the Union, after a resolution in favour of the principle, invited the masters to co-operate with them in the formation of a joint board. The latter ignored the invitation and Sir John Jones Jenkins (now Lord Glantawe) was then asked to call a joint meeting. This was done, and the board was formed on February 28th. At the first meeting it was resolved—

“ (1) That the production of tinplates in the tinplate trade be assimilated to the demand.

“ (2) That each individual works reduce make by one-third, the output based on 576 boxes per week per

mill,¹ work not to be concluded before 12 a.m. on Saturday."

Although a small majority of the mills were controlled by employing members of the Board, serious objection was taken to its action, and in the end it failed. The same arguments were employed as had been used against a price agreement. But it was also argued that a proportionate reduction of output would but perpetuate the existence of those older mills which would probably be forced out of existence by unregulated competition.

The cause in which the next attempt at united action was made was worthy of success; but the apathy of the manufacturers once more proved too great an obstacle. In the winter of 1895-6, when more than a quarter of the mills were totally idle, efforts were made to introduce tinplate as a substitute for wood in the making of tea-chests. A tin-chest enjoyed many advantages over its rival. It occupied less space and was lighter; it was both air and water-tight. It was said that, roughly speaking, on every 100 pound chest of tea there was a difference of ten pounds in tare weight in favour of the tin-chest, while there was a gain of nearly two inches in cubic space.² Again, in consequence of the cracks and crevices in wooden chests, not only was there considerable leakage, but tea was frequently damaged by water. These defects would be remedied by the employment of tinplate cases.

Well-attended meetings of manufacturers were held, a committee was appointed, and a company (with a capital of £20,000) proposed to finance a scheme of development. It was agreed that the subscriptions should be proportionate to the number of mills owned and that agents should be sent abroad to seek new markets. But the support of the manufacturers was so poor³ that the scheme

¹ 36 boxes per shift of eight hours

² Thus, in a cargo of 20,000 chests, there was a saving in freight and warehouse charges of 200,000 pounds tare weight and from twenty to forty thousand inches of cubic space

³ Proprietors of only 266 out of 510 mills promised to contribute

was abandoned. Shortly afterwards the Masters' Association, which had been in existence almost a decade, was dissolved.

Labour disputes were frequent during this period, for employers naturally sought to transfer as much of the loss as possible to the shoulders of the workmen. It will be shown at greater length in Chapter VIII that the policy of the trade union which existed at this time was to maintain the standard rate—the 1874 list—and to restrict the output per mill to thirty-six boxes per shift of eight hours. During the depression the employers, acting independently, sought relief by reducing wages and increasing output. Early in 1892 cases occurred of violation of the "make" rule, and for the next two years serious encroachments were also made upon the standard rate. Within a few weeks of the commencement of the wages struggle concessions in wages and "make" were common. Labour conditions were characterised by complete lack of uniformity. In some factories wages were 10 per cent. below the 1874 list, in others 15 per cent. and 20 per cent. The relative positions of employers paying the same rate were altered by varying concessions in output. In the autumn of 1893 the union executive suddenly enforced the "make" rule, and after a long struggle all concession of this character ceased. But only for a short time. The union was too weak to maintain the position it had won, and soon concessions again became general. In November of the same year the Llanelly workmen granted a reduction of 10 per cent. on the list, in reply to a demand for 25 per cent. And to preserve uniformity as far as possible, the executive was forced to grant a general reduction of 10 per cent. But that proved no remedy. For almost immediately those employers who had previously enjoyed a relative advantage demanded and succeeded in obtaining further reductions. A general struggle was inevitable, and after much fighting and with the aid of a temporary revival of trade in 1895 the 1874 list was regained in four-fifths of

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the works in operation.¹ Soon, however, the depression became worse than ever, wages disputes recommenced, and concession in "make" again became the rule. In April (1896) not a single employer paid the standard rate, reductions in wages varied between 10 per cent. and 25 per cent., the majority of the workmen conceding 10 per cent. and 15 per cent. The union at this time was so weak that dissolution seemed probable, and a meeting was convened to discuss the situation. The events which followed were characteristic of the period. The majority of the delegates present at the meeting strongly opposed dissolution. A wave of unionism passed over the trade, the number of active members increased rapidly, and in May a resolution was passed in favour of a return to the standard rate. Notices were handed in, and by the end of the year, after varying periods of idleness in different factories, the list had been regained.² The fight

¹ "The principal dispute, or rather series of disputes, was that which prevailed over a considerable portion of the South Wales and Monmouth district during July and August. Trade had then revived to some extent, and the workpeople at about sixty establishments came out in support of a demand for a return to the price list of 1874. It is difficult to fix either numbers or duration in this case, inasmuch as the movement was not general, or well-organised, and the concession demanded was made by individual employers at different dates. It is estimated that 9,000 persons were directly and indirectly concerned in the dispute, but it is not easy to fix the average percentage of advance gained by the men in this movement, as the variations from the 1874 list were so considerable, that the advantages gained ranged from 5 to 25 per cent" Report on Strikes and Lock-outs, 1895 (Cd 8231)

² "At a Council Meeting of tinplate makers held in Swansea on September 19th it was determined to endeavour by united action to regain the amended 1874 list. Accordingly notice was given on October 3rd to employers, owning forty-five works, intimating that work would cease if within a month the amended 1874 list were not granted

"With a few exceptions, the employers refused to concede the list, and on Monday, November 2nd, many of the mills were brought to a standstill. At one of the largest works in Llanelli, however, an arrangement was arrived at during the day, and the men resumed work on November 3rd on the understanding that during November they should work at a reduction of 5 per cent off the 1874 amended list, and that the full list should be paid from December 1st. The strike was finally settled by similar arrangements being subsequently made at the other works affected" Report on Strikes and Lock-outs, 1896 (Cd 8643)

was regarded by the men as the most important since 1874. And it certainly was a remarkable triumph. For the trade was passing through one of the worst periods of its history, and public opinion was strongly opposed to the action of the union. But the main arguments of the men were sound. They maintained that the American market was lost, and argued, in effect, that the demand for tinplate was extremely inelastic about the prices then ruling. The fall in price made possible by a reduction in wages was so insignificant that no appreciable increase in trade could be expected from it; a fall of $12\frac{1}{2}$ -15 per cent. in wages affected prices only to the extent of $2\frac{1}{2}d.$ or $3d.$ per box. Moreover, a uniform rate was not only a considerable advantage to the best employers, but also essential to the men; for by such means only could repeated reductions be prevented. A fall of 10 per cent. in the wages of A's men seriously affected the position of his rival B. Varying rates handicapped the good employers and forced them to seek compensatory reductions. When these had been granted A demanded further concessions. And this is precisely what happened during the period under consideration. Consequently some of the employers, too, were strongly in favour of enforcing the standard rate throughout the trade. They, like the workmen, agreed that the best policy was to force those who could not pay the 1874 list out of the trade.

A similar argument was employed in relation to restriction of output. Employers sought to reduce cost by increasing the "make."¹ This argument, assuming the desirability of restricting output under normal conditions, is equally valid; and even if such regulation be undesirable as a general policy, the attitude adopted by the workmen under the circumstances was amply justified. But the general policy of the union in relation to limitation of output will be more fully discussed in another chapter.

The triumph of the workmen was short-lived, for the union soon grew too weak to enforce the standard rate.

¹ In this way standing charges per unit were diminished

Even at first, when the 1874 list was paid, the "make" varied considerably between the different factories. But in a few weeks the rate itself was reduced in a number of places. By the autumn of 1897 so general had concessions and reductions become that the following resolution was passed in October at the half-yearly council meeting of the union: "That inasmuch as several leading works in the trade have given way to a reduction in wages, it be agreed that a reduction of not more than 15 per cent. off the 1874 list be submitted to in works where asked, to commence November 1st." Naturally all those employers who had not previously obtained them "asked"! Soon, for reasons to be stated later, the union, which had grown steadily weaker, practically ceased to exist. Wages varied from 15 per cent. to 30 per cent. below the 1874 list. But many of the employers recognised the wisdom of the policy of a uniform rate. A meeting of masters was called in 1898, a new list was prepared and submitted to the men. The outcome of the meeting was the formation of a new masters' association. But the situation with which it had to deal was quickly changed. At the end of 1898 trade revived rapidly, and the following year witnessed the return of prosperity; new unions appeared in the trade which demanded and received full recognition, and a Conciliation Board was formed which has remained in existence up to the present. The 1874 list, revised to meet the new conditions, was re-established in 1899, and has remained in force ever since. The revival in trade was entirely due to the growth of demand from those countries which, while the American market remained secure, had been neglected.

CHAPTER VI

MODERN ORGANISATION

I. GENERAL¹

CAUSES OF LOCALISATION

IN any discussion of the forces determining the location of an industry it is desirable to distinguish between those geographic factors or natural facilities which influence the choice of district, and those acquired or artificial advantages which result from concentration, and increase as the industry grows; in other words, to distinguish between the attracting power of a locality, and its holding power. Since these act in combination and cannot easily be distinguished, it is impossible to say which of the two sets of forces is the more important. For example, we shall find that the neighbourhood of Swansea, an ideally situated town on the Bristol Channel, possesses unrivalled

¹ It was originally intended to make a more detailed study of the organisation of capital in the tinplate trade, but it soon became evident that this could only be done by examining the bar and tinplate industries together, for the two have become practically one, and the study of one section involves a study of the other. Moreover, during the past decade the sheet-steel and galvanised sheet industries have made rapid progress in South Wales, and in some cases the manufacture of these articles has been conducted in what were originally tinplate factories. These industries, too, possess the same main features as the tinplate industry, and make use of the same raw material. In short, the organisations of the sheet-steel, galvanising, and tinplate trades are interdependent, and should be studied in combination with each other, and along with the steel bar industry. Consequently, the present chapter does not pretend to exhaust the subject. It should indeed be regarded as but an introduction to a more detailed study of the organisation of the finished steel industries of South Wales. It is more a series of notes than a continuous narrative. A comparative study of the organisation of capital in the finished-steel industries of Germany, Britain, and the United States calls for a separate volume.

advantages for the manufacture of steel, copper, tinplate, etc. Of these advantages many are natural, and have always been in existence, while others have been created by the continuous development of the metal and metallurgical industries, and by the recent exploitation of the anthracite coal-fields.

Some of the natural advantages are temporary in character; for example, the supplies of raw material, such as iron ore and coal, are strictly limited, and long before they are exhausted the original cause of the establishment of a dependent industry in that area will have passed away. The steel-works erected in Staffordshire, and in the mountainous district to the north of Glamorganshire (*i.e.*, many miles inland), were originally erected in those places in consequence of the proximity of coal and iron ore. But iron ore has become scarce, and all required for smelting purposes in South Wales is now imported, so that one of the natural advantages determining in the first instance the location of the steel factories has passed away, and the North Glamorgan steel-works continue in operation partly as a result of the momentum acquired in the past. Iron ore has to be carried many miles overland;¹ but this disadvantage is counterbalanced by the low cost of manufacture, resulting from the development of those economies which generally make their appearance when an industry has become firmly established. Other natural advantages, such as a natural harbour, nearness to foreign markets, etc., are permanent in character. Of the acquired advantages resulting from localisation, some, such as shipping and railway facilities, are enduring, while others are temporary.

Geographic conditions were more favourable for tinplate manufacture in England than in Germany during the 17th century. Macpherson, in his "Annals of Commerce," remarks that "it was indeed long justly wondered at, that England which had the best tin in Europe, and in the greatest quantity, and had iron enough for

¹ Coal mines and limestone quarries are to be found in the neighbourhood.

the purpose, should have so long continued to pay such great sums to foreign nations for what we might long since have made our own." But it needed a severe depression in the iron trade to waken the nation to the possibilities of the situation.

When Yarranton visited the Continent the German industry was carried on in Saxony, "in a large tract of mountainous land running from a place called Segar Hutton into a town called Awe, being in length about twenty miles; the tin works being there fixed upon a river running clear along the valley, and also upon some rivulets that run out of the mountains of Bohemia and Saxony." And "when these tinplates are there made and fitted for sale they are from the works dragged to the river Elbe, it being land carriage at least fifty miles and good part thereof very hilly and mountainous; and then sent down the river Elbe by water to Hamburg, paying several customs by the way. And from Hamburg they are sent unto all parts as far as trade and commerce is known."¹ Yarranton realised the difficulties encountered by the manufacturers of Germany, and was convinced that a competing industry could easily be established in this country, which was already more highly developed industrially than its rival. The natural advantages which would be enjoyed by home producers are indicated in the following passages:—

"I will begin in Monmouthshire, and go through the Forest of Dean, and there take notice what infinite quantities of raw iron is there made with bar-iron and wire; and consider the infinite number of men, horses, and carriages, which are to supply these works, and also digging of iron-stone, providing of cinders, carrying to the works, making it into sows and bars, cutting of wood, and converting it into charcoal. Consider also in all these parts the woods are not worth the cutting and bringing home by the owner to burn in their houses; and it is because in all those places there are pit-coals very cheap. Moreover there is yet a most great benefit to the Kingdome in general by the Sowand Iron made of the iron-stone and Roman

¹ Since Yarranton's day the conditions of manufacture have been changed, and the seat of the industry has been removed from Saxony to the Rhine Provinces.

cinders in the Forest of Dean; for that metal is of a most gentle, pliable, soft nature, easily and quickly to be wrought into manufacture over what any other iron is, and it is the best in the known world, and the greatest part of the sow iron is sent up Severne to the forges, into Worcestershire, Shropshire, Staffordshire, Warwickshire, and Cheshire, and there it is made into bar-iron

" God and Nature hath fitted us with two most advantageous minerals in this Nation for the procuring of wealth and riches, and putting the poor on work; and in places so well posted (for quickness and ease for carriage and recarriage by sea) that it would make men amazed that those minerals should (at this time) be under no better improvements. One of these rich (yet neglected) minerals is our tin in Cornwall; which place lies upon the sea, and thereby the commodity may (at all times) be shipt, either on the French or Spanish coasts, or for Ireland. And at this time this Commodity of Tinn is so low, that in Cornwall Tinn gives not above three pounds ten shillings the Hundredweight. The second mineral is the Roman Cinders and Iron-Stone, in the Forest of Dean, in the County of Gloucester, which makes the best iron for most uses in the world, works up to the best advantage, with delight and pleasure to the workman. This mineral is in Gloucestershire where the River Wye and the River Severne washes the east and south sides thereof, even as the Irish and Narrow Seas doth Cornwall "

Yarranton did not indicate the extent to which these geographic factors favoured England. Being deprived of his right to manufacture¹ he crossed over to Ireland, and there selected a district which appeared suitable for the purpose. Although Ireland was not so favourably situated as the West of England, it enjoyed a distinct advantage over Saxony. According to this 17th century economist—

" Dean Iron would be £10 per ton at works in Ireland. Saxon Iron is £16 at their works

" Cornish Tin would be £70 per ton at works in Ireland. Saxon Tinn is £100 at their works

" Charcoal (made in Ireland) would be 12s the load. Saxon Charcoal is 16s. the load "

The natural advantages indicated by Yarranton were no less evident in 1720, when the manufacture of tinplate

¹ The patent was granted to a court favourite.

beyond the stage of experiment really commenced. The first factory was erected at Pontypool, and for many years Monmouthshire remained the centre of the industry. "After the successful start at Pontypool the manufacture began to extend itself through Wales, particularly in those situations where water power was available, and where forges already existed for the manufacture of charcoal iron.¹ And from Pontypool it spread to Caerleon and Ponthir in Monmouthshire, to Ynysgerwn near Neath, and Melingriffith near Cardiff in Glamorganshire, and to Kidwelly in the County of Carmarthen."²

In the early days of the industry Staffordshire and Gloucestershire constituted an area of some importance, but the factories of those counties were so far inland that afterwards they became less so, and the centre of the industry travelled west and towards the coast. While raw material was obtained mainly from the Forest of Dean it was more economical to manufacture tinplate in the vicinity and convey the finished product to the coast; for, since carriage on waste was saved, the freight was a lower percentage of the cost on the more highly finished article. Since that time, however, changes have taken place in the conditions under which the industry is carried on. Steel bar has displaced iron as the raw material, and all the iron ore is now imported. The result is that most of the steel-works erected since the transition are to be found in the western district, near the coast.

It is often profitable to distinguish the competition of large areas for an industry from that of small districts within a large area. Other things being equal the area is determined by natural facilities of a well-defined character;³ within this area the centre travels along the line

¹ Pit-coal had not yet been introduced for this purpose.

² Flower. "History of the Trade in Tin and Tinplate"

³ These fall into three main classes, according as they affect (1) the provision of the necessary power for driving machinery, (2) the cost of assembling the raw materials, (3) the cost of distributing the finished product. It will be evident that, assuming the source of power to be widely distributed, or easily obtainable, the location of the industry, relatively to the area of production of raw material and the market for the finished product, will be determined as follows.

of least resistance until the adjustment is complete. In the United States Census, 1901, in which such a distinction is drawn, and the advantages are indicated which operate to prescribe a large area within which it is profitable to establish an industry, it is stated that "the exact point within this area at which it shall be actual, that is the centre of localisation, is usually the result of a more or less chance decision made in the early days of manufacture by some pioneer in the industry.¹ Once successfully

If, as in the production of pig-iron, much of the raw material (iron ore) becomes waste, the tendency is for the industry to be located near the raw material; for in this way the cost of carriage on waste is saved. Hence the relative decline of the pig-iron industry in South Wales. If, however, little or none of the raw material becomes waste, it is a matter of indifference, other things being equal, where, on the line drawn between the area producing such material and the market, the manufacturing industry is placed. And purely local considerations play a large part. Hence the growth of independent bar mills in West Glamorgan and East Carmarthenshire, depending more and more upon imported pig-iron. There is *some* waste in the transformation of iron into steel bar, but not nearly so much as in the conversion of ore into pig-iron.

Consequently, where the source of power is localised there are, in the first case, three forces tugging in different directions (power, raw material, and market), and in the second case, the force towards power and the combined force created by raw material and market, acting on the line between the two, and, other things being equal, with greatest strength at the nearest point to the source of power, *i.e.*, at the join of the perpendicular from the source of power upon the line, and the line itself. In the iron and steel industries, since coal is used not only to provide power, but also in the gas producers or melting furnaces, or both, there is a two-fold attraction towards the mining districts. The above general argument suggests that under certain conditions progress in the utilisation of by-products may lead to a wider distribution of industry. But to follow this further would carry one beyond the limits of the monograph. I am indebted to Mr. G. G. Chisholm for the general idea developed above, and to his admirable treatise on commercial geography for many suggestions invaluable at an early stage of this investigation.

¹ The locality within an area which is selected for the establishment of an industry is often determined, not so much by chance as by local considerations, such as rating conditions. When tinplate factories were about to be erected in America some municipalities offered manufacturers free sites, freedom from rates, and in some cases even bounties, as inducements to erect the factories within their boundaries. The value of the surrounding land would clearly be enhanced, and the rateable value of the district so largely increased that the loss to the municipality of rates and ground rent from the factory owners would be fully compensated. In tinplate manufacture the necessity for an adequate supply of pure water is, as will be shown later, an important factor in the choice of a site.

started the manufacture gains momentum which enables it to persist in the original locality long after the earlier general advantages it possessed have disappeared." This is probably true of industries established in recent years in the United States, but it is scarcely true of those created in this country in the early days of machine production. The statement assumes not only considerable expenditure upon fixed capital, but also other characteristics of modern industry, such as the growth of subsidiary industries in the locality, the provision of transport facilities, specialisation of labour, etc.; in short, it assumes that the advantages resulting from localisation and concentration are of greater significance than those which originally determined the area. This assumption is well brought out in another passage:—

" When once an industry has been established in any country or locality certain causes at once come into play which tend to lead to its continuance. Even if the origin is accidental the initial advantage of position may sometimes be sufficient to withstand competition. With inferior natural advantages both labour and capital become specialised and gain in efficiency through continuous improvements."

But this assumption is not quite true in relation to tinplate manufacture. In the first place, the industry was (and is) only moderately capitalistic; standing charges formed but a small proportion of the total cost. Factories could be erected easily and quickly, and the machinery was comparatively simple. The inertia which it possessed forty years ago was given to it by its dependence upon the iron industry. The tinplate factory was in many instances merely an adjunct of the iron factory. The erection of the latter involved far greater expenditure of capital, and in consequence the industry of which it formed part was much less movable. In the second place, the change from iron to steel in the early eighties meant practically a restart. The new material was at first obtained mainly from those Bessemer steel works which had been substituted for iron works in the vicinity of the

iron ore. But increasing use was made of Siemens steel manufactured from imported material, and the new factories in which it was made were erected as near the open sea as possible. In short, during the last forty years the steel and the tinplate industries have travelled west and towards the coast; and it is extremely likely that the district between Llanelli and Port Talbot will continue to develop more rapidly than the eastern district.

Localisation is partly determined by knowledge of the industry and the capital available for investment in it. Yarranton was financed by men who were interested in iron manufacture, whose object in establishing the tinplate industry was to relieve the existing depression in the iron trade by creating a market for the bar-iron.¹

In 1720, when the industry was finally established in this country, it was again regarded as affording a market for the bar-iron. The first factory was erected at Pontypool, Monmouthshire, as an adjunct of the iron works. As the demand for tinplate increased owners of other factories found it profitable to add a tinplate department. At that time, as already indicated, the industry followed the iron; iron bars for tinplate purposes formed in most cases part only of the output of the furnace and forge. When iron gave way to steel as the raw material the character of the tinplate industry was changed. The output increased steadily and continuously, and the industry was no longer regarded as the minor one. The former grew to be the chief, and the industry engaged in making Siemens bars became dependent and subsidiary. Bessemer steel-works, on the other hand, are only partly dependent upon the tinplate industry; bars form but a portion of the total output of steel; for rails and other materials are also manufactured at those factories.

¹ The United States supplies a similar example. Before the McKinley Tariff Act was passed the steel industry had been making rapid strides in some of the Southern States, and the competition of supplies from this region was beginning to be felt by the Northern manufacturers. Consequently the latter strongly supported the McKinley duty on tinplates, arguing that an American tinplate industry would create a market for the new supplies of steel resulting from the recent exploitation of the Southern ore region.

In the early days of the Bessemer steel industry South Wales was the "most extensive steel producing district in the world, having no fewer than six large plants in regular operation,"¹ but some of these have now been closed down. Mr. Jeans points out, indeed, that although the historical claims of the district are considerable, South Wales does not possess "natural resources of the first order. Its coal, which is chiefly suited for steaming purposes, is more costly than that of most other British fields. Its iron ores, always relatively costly, have now been almost entirely superseded by imported materials from Spain and elsewhere. It is mountainous, and most of the important works are situated at elevations which render railway transport relatively expensive. It is more or less like the fly in amber which led the savant to wonder how it got there." Mr. Jeans here obviously refers to the Bessemer steel industry rather than the Siemens. The former is decaying, but the latter is making rapid progress. The former consists of a few factories erected in the old iron ore district, on the site of the previously existing iron factories. They are far inland, and the transport charges for iron ore are heavy; and, as already indicated, tinplate bars form but one of the products. But Siemens steel factories have been erected near the coast, and in close proximity to tinplate factories; and the natural facilities provided by the districts in which they are situated are, as we shall find, by no means inconsiderable. Moreover, the erection of Bessemer plant involves an enormous expenditure of capital, much more than is required to build a Siemens bar mill. Consequently, we find that while some tinplate manufacturers began early to erect the latter to supply raw material, those who were engaged in the manufacture of Bessemer tinplate always purchased their bars from independent makers.

Naturally, with the progress of invention and the movement towards concentration and production on a large scale the inertia of the industry increased. It is obvious that the larger the proportion of fixed charges in

¹ J. S. Jeans, "Iron Trade of Great Britain," p. 34.

the total cost, the more likely is an industry to remain where it has been established; natural advantages have relatively less force, while those resulting from concentration and growth acquire greater weight.

The nature of the advantages possessed by England over Germany in the 17th century has changed. It is still of the greatest importance to have a supply of raw material—tin, coal, and iron ore. Since all the iron ore is now imported, large blast furnaces have been erected near the coast; and in close proximity to those are found melting furnaces and bar mills, in which the pig-iron is converted into ingots, and the latter in turn into tinplate bars. Competing with the pig-iron produced locally are supplies sent coastwise from Cumberland (chiefly), Scotland and the north-east of England (in smaller quantities), as well as imported from Germany and America. These foreign countries, as will be seen later, also export to South Wales sheet and tinplate bars, which compete directly with those produced locally. Thus an adequate supply of one raw material is fully secured.

Coal must also be accessible. But the chief advantage of cheap coal appears not so much in the manufacture of tinplate as in the production of tinplate bar. Directly, coal enters into the cost of production of tinplate to the extent of about 6d. per box only, and a rise of 25 per cent. in the price of coal would (assuming no change in the price of the bar) increase the cost of production by 1½d. per box only. But coal is a much more important item in the manufacture of tinplate bar, and the advantages of cheap supplies of the former and of iron ore are expressed in the cost of producing the latter.

In regard to tin the advantage once held has been almost completely lost. In the first place the importance of this raw material has diminished relatively to that of steel and labour. While about thirty-five years ago the quantity of tin used in making a box of tinplates varied from six to eight pounds, not more than two pounds per box (sometimes even less) is now allowed for ordinary coke tinplates. And since other factors have not been affected

in the same degree, the proportion of the cost of tin to the total cost of production has largely diminished. But the significance of this change is not accurately measured by the reduction in the quantity of the tin used, for two reasons. The total cost of production is less than it was thirty years ago. Moreover, partly as a result of the establishment of an American industry, which has captured the home market, and even succeeded in effecting an entry into the Canadian market, the significance of a change in the cost of a factor in production is probably much greater now than at any time before the McKinley tariff was imposed: although, even to-day, a small change is of minor significance only.

In the second place, in the early days of the tinplate industry, Cornwall possessed a monopoly of the supply of tin. But this has been lost, and Cornish tin is rarely, if ever, used now by South Wales manufacturers. It is chiefly imported from the Straits Settlements, etc., and being, in block form, very portable, it can be sent almost as cheaply to American factories as to our own.

Before the introduction of steam power into tinplate factories the machinery was driven by water power; accordingly, we find that the early factories were erected upon the banks of those rivers which had a good natural fall, and long after steam power was introduced those factories continued in operation (and in some cases still do), having been, as it were, urged forward by the impetus given to them by the early advantage which they enjoyed.

At present nearly all the mills in the trade are being driven by steam.¹ But a large and steady supply of clean water is still one of the essentials of successful production, and a factor to be considered in the determination of the site of a new factory. Pure water is required for cleaning plates after pickling, and for holding plates

¹ Water power is only employed in two or three mills in one factory. Experiments are now being made with electrical machinery, but it is too early to say whether the main difficulties have been overcome. The introduction of electric power into copper mills seems to have been attended with success.

when ready for tinning. In some cases a steady supply has been secured by the construction of reservoirs near the factories; in other cases the factory is connected with the main supplying the local (or a neighbouring) borough with water.¹

Climatic conditions do not affect manufacture to a very large degree, but in this respect, too, there is a slight advantage in favour of Wales. For in this country it is rarely so hot in summer as to interfere with the output, and never so cold in winter as to make outdoor work difficult. In the United States, on the other hand, the men working at the furnaces and in the mills are frequently forced in summer to stop. But climate is not a factor of great direct importance.

In regard to those conditions of successful manufacture which we have already considered (except water power), South Wales held an advantage over other countries. But the monopoly of production has now been lost, and the American industry, assisted by preferential tariffs, is in a position to supply the home market. Preferential treatment appears to be necessary to counterbalance the greatest advantage still enjoyed by this country, viz., cheap labour.

The tinplate industry is but moderately capitalistic,² and standing charges form a comparatively small proportion of the total cost. The two main elements in cost are steel and labour. It is probably true to say that direct labour cost represents between 20 per cent. and 25 per cent. of the total cost.³ An unusually large proportion of

¹ Most of the works in Swansea Valley make use of canal water for the boilers and river water for the condensers. If the former is not obtainable special plant for filtering has to be obtained. The waste sulphuric and other acids from the factories are allowed to run into the river, so that if this (river) water were utilised in the boilers corrosion would result.

² That is to say, the relative expenditure upon fixed capital is not very heavy.

³ It is now nearer 20 per cent. than 25. The proportion has been slightly reduced during the past twenty years by the introduction of machinery in the tinhouse. The full effect of such machinery upon the percentage labour cost is hidden by the contrary effect of a considerable increase of the output per mill during the past ten years.

the people employed in tinplate factories are skilled workers. In the mills the work is much divided and fairly highly skilled, but not highly specialised. For there are other industries, such as those engaged in the manufacture of galvanised sheets, sheet-steel, and other steel products, which require men to do work almost the same in its essentials. In the pickling department the work is not highly skilled; but the supervision of the annealing process calls for extensive knowledge of furnaces. In the tinhouse the work is highly specialised, and some of the tasks involve a fairly high degree of skill. The work in this department does not involve the physical strain which is imposed upon the men employed at the rolling mills. They do not handle heavy material, but they work under more unhealthy conditions. The tinhouse is often close and stuffy, and the atmosphere laden with dust. On the whole the operatives engaged in the tinhouse seem to be more delicate than those in the mills, a difference due mainly to the fact that greater muscular strength is from the first required in the mills, but also probably due in some degree to the reaction of the conditions of work in the tinhouse upon the body. Women and boys are employed in tinplate manufacture, and a scarcity of female labour is a considerable disadvantage.

All writers on economics emphasise the importance of an adequate supply of labour as a condition of development of particular industries. In considering this problem

Although the total standing charges per factory have increased, the standing charges per unit of output have not advanced to the same degree, for the total charges are distributed over a greater production. It is this fact which has kept labour cost almost constant. This provides an excellent illustration of a truth frequently ignored, viz. that the total expenditure of capital upon plant does not necessarily reflect the "supplementary" cost per unit. The growth of capitalism within an industry is best reflected in the steady increase, other things being equal, of the percentage cost, per unit, of the raw material. And where the cost of raw material is also reduced the improved methods, while involving displacement of labour, may leave the relative costs of raw material, labour, and capital practically unchanged. Infinite variations in the relative costs of the different items are possible, so that any correlation of changes in methods of production with changes in the relative importance of the constituent elements in cost is quite impossible.

one needs to distinguish very carefully between (*a*) the large supply of labour which may be required immediately to start a new factory or to create a new industry, and (*b*) the supply of two, three, or even a dozen men who may be required to fill vacant places. The latter is not a very serious consideration now. Dr. Marshall, in his "Principles of Economics," states that one of the advantages of industrial concentration is that it provides a local market for skill. "The owner of an isolated factory," he writes, "is often put to great shifts for want of some special skilled labour which has suddenly run short; and a skilled workman when out of employment has no easy refuge." Modern improvements in transport have lessened the importance of this consideration. A substitute can be sent to the tinplate works at Mold (North Wales) almost as quickly as to one of those inland factories of South Wales situated some distance from the main railway lines. But to obtain a large supply of labour immediately, at the normal cost for the industry, is a totally different matter. It has already been observed that Bessemer steel factories are in some cases situated at considerable distances from the tinplate works which they supply with bars. It appears that the owners of one of the former once erected tin mills adjoining the steel-works, with the idea of completing the manufacture of tinplate, and of thus saving in freight charges. But it was found impossible to obtain an adequate supply of suitable labour, and the attempt was abandoned. Few men will accept work at a distance of twenty miles from their homes while they can obtain satisfactory employment at hand; and the offer of a higher wage is necessary to serve as an inducement. But if this were done on a large scale it would nullify the advantages enjoyed by the distant manufacturer in other directions. To start a new factory, especially in a new district, it is necessary to employ largely the relatively inefficient workers from other factories in that district, people on the margin of employment, who have been dismissed, perhaps, more than once for incompetence. This fact,

more than any other, accounted for the failure of the above attempt.

The labour difficulty is perhaps one of the greatest encountered by manufacturers during a period of trade expansion. One may fairly assume that when new factories are being erected to meet an increasing demand the factories already existing are working full time, and all the men in the trade are busily employed. During a period of depression, when, perhaps, some obsolete factories are closed, whereby an adequate supply of labour becomes available, there is naturally no desire on the part of manufacturers to erect new factories. During 1911 the producing capacity of the industry increased at a surprising rate; new mills were erected in many places, and in some tinplate factories sheet mills were added. But the manufacturers found the greatest difficulty in obtaining workmen; and it is probably true to say that the growth was somewhat retarded by the deficiency in labour supply. Youths were promoted to positions which had hitherto been filled by experienced men only, and the lack of skill displayed by these new workmen proved costly to the manufacturers.

The American industry was established about twenty years ago with the assistance of Welsh workmen. After the McKinley Act had been in operation a short time some manufacturers went to the States from South Wales, taking with them a sufficient supply of their best workmen. They erected tinning sets in the new country, and proceeded to coat with tin the blackplates manufactured at their factories in South Wales. Such was the beginning of the tinplate industry in America. The men who left this country were those mainly engaged in the tinhouse as tinmen and washmen. And it was much debated afterwards whether the industry could have been established in America without the aid of Welshmen. In 1895, four years after the Act had come into operation, a commissioner was sent by "The Engineer" to investigate the progress of the new industry. He obtained various, and in many cases contradictory replies to this question from

the manufacturers. Some declared the difficulties of establishing the industry to have been so great that without the aid of skilled labour from Wales few manufacturers would have persevered. A letter from an American firm stated that "it is all nonsense about coal-miners, labourers, grocery clerks, etc., being easily trained into the position of rollers, sheeters, doublers, etc. Of course, there is not the Union nonsense about it over here that there is in England, but at the same time it does require skilled labour to roll sheets,¹ as you can spoil more iron, break more rollers, and lose more money in shearings if you have a poor rollerman than any low wages could make up for." Other manufacturers, however, declared that they had been able to manufacture tinplate without the assistance of imported labour. Welsh workmen, they argued, were very dissatisfied and far too ready to create labour disputes, and in consequence were far less satisfactory than Americans. Probably, however, the latter—especially those engaged in the tinhouse—were taught in factories at which Welshmen were, or had been, employed. Attempts had been made forty years before to manufacture tinplate in America, but these had ended in failure, and the cause of failure was said to have been the inexperience of the workmen. But in those early days the process of tinning was more complicated than at the time the McKinley Act was passed, and success depended almost entirely upon the skill of the tinmen and washmen. When patent tinning-pots were introduced the labour processes were much simplified, although even afterwards the task of the above-mentioned workmen was far from simple. But different conditions prevailed in the rolling mills. There already existed, in the States, mills producing iron and steel sheets for roofing purposes, and the process of manufacture differed but slightly from the

¹ The experience at some of the factories in the Swansea district, where new sheet mills were recently erected, provides an excellent illustration of the costliness of inefficient labour. Inexperienced men were given skilled work to do because no skilled workers could be found, and the result was that expensive rolls were broken very frequently.

other. Consequently it can scarcely be maintained tha Welsh millmen were absolutely essential. It is true tha a number went to America in the middle of the nineties but their emigration was due more to the difficulty o finding employment in Wales and to the greatness o demand for workmen in America, than to the necessity for their guidance. One may conclude, then, that whilst the tin mills could have been operated without assistance from Wales, it was necessary under the old condition of manufacture to obtain a supply of skilled labour in the tinhouse. But before many years had passed the introduction of improved tinning sets displaced the washmen, and simplified to some extent the work of the tinmen. It is thus probable that American workmen would hav acquired without much instruction the skill necessary to manufacture under the new conditions.

Under the old methods of production a considerabl proportion of the operatives in the tinhouse consisted o females and boys. Their labour was largely mechanical In those sets which are devoted to the manufacture o ordinary grades, machinery now does most of the wor which was previously done by women and girls. Bu boy labour is still necessary. In the mills, too, female and boys are engaged, the former in opening plates, an both in the pickling and cold-rolling departments. Th advantage possessed by this country over America in thi respect is still considerable. In the States female labou is scarce, while boys do not commence at so early an ag as in South Wales. The following statistics afford rough indication of the extent of this advantage abo 1901. From these it will be seen that of the total c 7,231 work-people in the United States industry, 277 were females; that is to say, the proportion of males to female was seventy to three. In this country in the same year 1,967 females were employed out of a total of 15,015; tha is to say, roughly one-eighth of the operatives were females.

Country	Men (over 20)	Males	Boys (under 20)	Females		Total
				Married	Unmarried	
Britain (1901)	9,752	3,296		73	1,894	15,015
U.S.A. (1900) ..		6,954			277	7,231

Country	Men	Women	Children	Total
Germany (about 1903)	2,333	147	520	3,000

Country	Over 18	Males	Under 18	Females		Total
				Over 18	Under 18	
Britain (1906)	15,615	2,967		1,849	791	21,222
		18,581			2,640	

Proportion just the same as in 1901

The high labour cost in America is the greatest disadvantage from which the local manufacturers suffer. Not only is female and boy labour relatively scarce, but the prevailing wages rate for men is considerably higher than in this country. These two facts tend to raise the cost of labour in manufacture; and the efforts of American employers have for some years been mainly directed towards removing this disadvantage. This has been partly achieved by applying the principle of division of labour further than in this country, *i.e.*, by increasing the efficiency of labour through improved organisation. To take one example, American millmen are assisted by " helpers," who relieve the others when necessary. The total wages cost of working these rolls is obviously higher than in this country; and since piece rates are paid the labour cost per box is also higher. But the output has by this means been largely increased, and supplementary charges have been reduced more than in proportion to the increase in labour cost. Again, the output in America has been increased by a change in the method of rolling—plates are " matched," whereas here they are " doubled." The total cost is therefore lower than it would otherwise be.

Until quite recently in this country the efficiency of labour in most of the departments varied little between different places, for the output of each mill was limited to thirty-six boxes per shift of eight hours. When the custom was abolished, and it became the universal policy to "follow the machinery," the output was increased 20, 30, and in some cases 40 per cent. While this custom of restricting output prevailed, no incentive was provided to improve the machinery in the mills; but now, since any improvement reacts favourably upon the manufacturers, better methods are constantly being introduced. Nevertheless, the average output per mill is still less than in America. This cannot be due to any difference in the capacities of the workmen; for Welshmen who emigrate to the States immediately produce the American average number of boxes per shift. Probably the cause is to be found in the existing method of doubling plates, in employing fewer workmen at each pair of rolls, and in using rolls with lighter housings.

RESULTS OF LOCALISATION

A distinction has already been drawn between the attracting and holding power of a locality. An industry is first of all attracted by the natural facilities provided by a particular area. The cost of assembling materials and of providing power may be low, or the locality may be an admirable distributing centre in virtue of its proximity to markets. When, as sometimes happens, a district enjoys a double advantage, it is certain to grow relatively to others. The concentration and growth of an industry bring other advantages in their train. Perhaps the most obvious of these is the creation and development of dependent or subsidiary trades; but others, too, are of no little importance. In the first place, when a number of factories are built in the same district and enjoy the same local advantages; when the owners or managers meet to discuss matters on the same exchange weekly, rivalry becomes keener, enterprise is stimulated, the manufac-

turers are always kept on the alert and ready to substitute cheaper methods for more expensive ones. If the industry is such that manufacture on a large scale is cheaper than on a small scale, a strong tendency in the former direction soon becomes evident.

In the second place, a frequent result of such competition is that some manufacturers "find their market," that is to say, they soon obtain regular custom and cease to produce primarily for the general market. In such cases, if the merchant makes an appearance at all it is as an agent acting on behalf of a foreign firm. But, more often than not, such a trade is carried on without an intermediary. Sometimes, too, the market for certain qualities of goods becomes so large and steady that sales even to merchants can always be guaranteed. Under these circumstances a strong tendency often appears towards specialisation of output. Differentiation of this character and to this degree indicates a highly organised market.

Finally, concentration becomes, in the long run, a guarantee of an adequate supply of the requisite kind of labour. Not only are people of the right stamp attracted to the district, confident of their ability to find work, but—and this is a more important factor—fathers bring up their sons to the same trade. In the tinplate trade the sons of the men working in the various departments are sent as boys to the cold-rolling department or to the tinhause. When they grow to be men those trained in the former are taken on in the mills, and those in the latter learn to operate the tinning sets. From the outset they are in close contact with those men who are doing the same kind of work as they themselves will ultimately be engaged upon; and when a boy is promoted he merely requires a little practice to become skilled in the lower-grade occupations of adult piece-workers, e.g., "behinders." For years he has lived in the atmosphere of his future work, watched the men and handled the plates, and by the time he has acquired the necessary strength he merely lacks experience in the new routine.

While it is desirable for many purposes to separate this group of advantages from those affecting the cost of assembling the raw material and distributing the product, it must be observed that the former, which is said to constitute the holding power of a locality and to give it inertia, may prove after some time to be one of the greatest attracting powers operating either upon the same industry or upon other industries. In tinplate manufacture the growth of dependent trades has proved to be an economy of the first importance. It has already been shown that in the early days iron forges were built on the banks of rivers, and that tinplate departments were added. When steel was generally substituted for iron as the raw material, steel factories were erected in place of the iron forges. In consequence, the trade increased very rapidly and additional steel and tinplate factories became necessary. The latter were erected near the coast and mainly in the western area, and the steel factories were built in the vicinity. Some of the larger tinplate manufacturers built steel-works of their own to supply the raw material. The cost of carriage on the raw material was thus reduced, expenses of marketing were avoided, and the desired quality of raw material was guaranteed.¹ Again, engineering foundries were built,² as well as small factories in which elm boxes, etc., were made. Docks were constructed, and warehouses erected to facilitate the export trade.

Other economies apply more particularly to Swansea and district, and result from the co-existence of other metal trades and of coal mines, which call forth identical subsidiary industries. The resulting advantages are therefore such as would follow from a large extension of

¹ How many manufacturers controlled the two stages I cannot say, but the following "mixed" works were in Swansea Valley alone Cwmbwrla, Cwmfelin, Duffryn, Forest and Worcester, and Pontardawe. There were probably more in the same valley, and there were others in Llanelli, Gowerton, Briton Ferry, and Port Talbot. I am not well acquainted with Monmouthshire.

² The "shop" forms part of some tinplate factories, so that what would appear in the cost sheet under wages and raw material would be called repairs in smaller factories where such work is done by an independent firm.

one of the metal trades, such as the manufacture of copper plates, galvanised sheets,¹ etc. It would be difficult to exaggerate the advantages enjoyed by this district in steel and tinplate manufacture. In the first place, the cost of assembling materials is exceedingly low. Pig-iron and iron ore are sent by water from British ports, Germany, America, and Spain, and distributed quickly and cheaply to the various works by means of the three main railways² which serve Swansea. Cheap coal is obtainable for all factory purposes; palm-oil is shipped from Liverpool, boxes from the counties of Somerset, Devon, and Gloucester. During normal periods a plentiful supply of labour is obtainable. Parents bring up their children to the trade; and as the wages in most branches are exceptionally high, and employment fluctuates but slightly, there is little tendency for boys to leave for other more alluring occupations.³ In the second place, Swansea enjoys considerable advantages over most other places as a distributing centre. Boats can load at and sail from the port to America almost as quickly as from Liverpool. If ships leave Liverpool or Birkenhead for foreign ports not in direct communication with Swansea, tinplates can

¹ It is interesting to note in this connection that the manufacture of galvanised sheets in South Wales owes its prosperity, if not its existence, to the development of the tinplate trade. Not only can steel be obtained much more cheaply than would otherwise be possible, but another considerable economy existed in the shape of tinplate factories which were at one time superfluous; and these could be converted into galvanising works at little cost. This clearly shows that even some forms of fixed capital possess considerable mobility.

² The Great Western (including the Rhondda and Swansea Bay Railway), the London and North-Western, and the Midland

³ Some difficulty was experienced recently in obtaining an adequate supply of boy labour. The boys were attracted to the coal mines, mainly, I believe, on account of the difference in the age at which they were allowed to commence. While they were permitted to work in the mines at thirteen, they were not allowed to start in tinplate works until they reached the age of fourteen. The difficulty could scarcely be accounted for by difference in wages and prospects, for not only is there greater prospect of high wages ultimately in tinplate manufacture, but the wages paid to boys in the mills are high relatively to those prevailing in most industries. I believe they are lower than a boy may earn in coal mining; but the attraction to the mines should be greater from other industries than from tinplate manufacture.

be sent in coasting steamers to the Mersey ports and there re-shipped. Large boats from Liverpool to South America, Australia, and the East can call for cargo at Swansea with less delay and expense than at Cardiff, Newport, or (say) Glasgow. It is also more convenient for the Continent than any of the Bristol Channel or Mersey ports. For supplying the home market, too, it is more advantageously situated than most other towns. Coasting steamers can easily, and at very low rates of freight, take tinplates to Bristol, South of England, London, Hull, and the East Coast, Ireland, and the West Coast; and these coasters also bring general cargo on their return voyages. But goods cannot be sent to the Midlands and other inland places quite so cheaply and quickly as from Cardiff and the various Monmouthshire tinplate towns. Finally, Swansea enjoys to the fullest extent the advantages resulting from concentration. As already indicated, it is a large railway centre, and shipping facilities have been enormously improved and extended in recent years. Castings of all kinds are manufactured in the district, including pots, rolls, standards, riders, spindles, brasses, etc. In short, probably few industrial areas rest upon so secure a foundation as that part of the country lying between Port Talbot and Llanelly, *i.e.*, the district around Swansea.

It is a source of wonder to many people that tinplate can be manufactured in Mold, Flintshire, a district very remote from the centre of the industry. But in this district the materials can be assembled very cheaply, while a special market is almost at hand. Adequate supplies of local coal, iron, and pure water are obtainable; and the steel made in the district is said to be the best manufactured for the purpose. In the early days, when Liverpool was the main distributing centre, Mold plates could be sent thither by rail quickly and cheaply. At the present time, however, they are sent to the district engaged in the manufacture of cotton to be used for packing cotton goods.

GROWTH OF LARGE SCALE PRODUCTION

One of the main features of recent history is the rapidity with which the size of the representative business unit is increasing.¹ Considerable economies result from production on a large scale. They are mainly such as bring a reduction in the standing charges. Some of these economies may be very briefly indicated. (a) The salary of a manager of a factory containing four mills may be (say) £300. If the number of mills be doubled the salary may be increased to (say) £500, and consequently a saving of £100 effected. (b) The cost of superintendence is reduced. Since a mill foreman can control eight mills, any increase in the number of mills up to eight will not involve additional cost of superintendence. (c) Other savings refer to machinery, engines, wages of day men (such as engine-drivers, shunters), etc. Provided sidings are well laid, one locomotive can do the necessary work for twelve mills, so that an increase of mills up to this limit does not involve much additional expense in this direction. Again, considerable saving may be effected in steaming. Three up-to-date boilers of the necessary pressure can produce enough steam to operate twelve mills, while two at least would be required for a factory containing six mills. In short, fixed charges, and the wages of the artisan group are not increased in proportion to the increase in the number of mills. (d) Large quantities of raw material, especially of coal, castings, and general stores, can be purchased at slightly lower prices than those charged for small quantities. If purchases of pig-iron, iron ore, scrap, etc., are on a sufficiently large scale, a boat may be specially chartered by one firm and the freight rates thus reduced. (e) Finally, a large factory allows greater subdivision in the office staff.

The advantage which one factory enjoys over another is largely due to management. As far back as 1894, Sir John Jones Jenkins (now Lord Glantawe) laid stress upon this factor. "I have always said that the success

¹ The extent of concentration will be indicated later

of a tinplate works depends very largely, if not entirely, upon careful and economical management. The greatest care must be exercised in every department to ensure against waste, and unless the men work cordially and intelligently with the management it is impossible to guard against it. That, I believe, is one of the main reasons why some works in this country pay better than others."¹

Differences in management partly explain the successful competition of the small manufacturer with the larger firms; the manager of the small factory is able personally to supervise the workmen, and to do many things which the manager in a large works is forced to leave to his subordinates.

One of the main advantages of large scale production is the increased power enjoyed by the manager in the matter of organising labour. The full economic efficiency of the labourer depends upon a number of factors. In the first place it varies with the personal qualities of the workman, such as muscular strength, skill, etc. An unskilful rollerman who constantly breaks rolls is obviously an expensive luxury.² In the second place, efficiency depends upon the character of the machinery. While a limited output of thirty-six boxes per day was the custom in the trade, this was not an important consideration; but during the last twelve years or so workmen have "followed the machinery," and their output has consequently varied partly with its strength and weight. Until this century no inducement existed to improve the machinery; additional expenditure in this direction brought no advantage; but now, since increased efficiency is reflected in the output, and consequently in cost, a sum spent upon improvements may be repaid in increased profits within a short space of time. A third factor upon which the full economic efficiency of labour depends is the nature of the raw material. In this trade, as in others,

¹ "South Wales Daily News"

² Breakages account for a very large proportion of the expenditure on rolls, for these deteriorate very slowly. After a pair has been used in "finishing" for several months it can be transferred to the "roughing" sets and utilised there for an equally long period

the output varies with the quality of the steel which is handled. If it is very dry the girl openers find great difficulty in separating the plates, of which many have to be thrown aside. Finally, the efficiency of a workman varies with the character of the group in which he is placed. Economists have long since shown that to obtain the maximum benefit from division of labour each worker should be placed upon a task which will call forth all his energies. But this may be impossible if men work together in groups. The rate of output in such a case is determined by the speed at which the least efficient of the group works. And this is what we find in the tinplate industry. A group of men work together in the rolling mills. If a rollerman is very skilful, and the "receiver" or "behinder" relatively slow, the rate of output is not indicative of the skill of the former, but is determined by the latter. And one of the many advantages of large scale production is the greater possibility of increasing the efficiency of labour by grouping together people of appropriate skill. In a large factory the manager has greater power of selection, and by placing the good with the good the waste of skill is diminished and the rate of output increased. The most efficient group is that in which the slowest worker is more efficient than the slowest worker of the other groups; and the wages of each member are determined by the output of the group. Accordingly, in forming a combination for a mill, the interests of the master are identical with those of the workers. An increase in the output of a mill means higher wages to the latter, and a reduction in cost to the former; for the standing charges are practically the same in a week during which the output has averaged forty boxes per shift, as in one for which the average reaches fifty boxes; and the greater the output, the lower the cost per box.

One of the most important problems of industrial organisation is that of specialisation. In this, as in other trades, development and growth have been accompanied by differentiation of function. (1) The first and most obvious form of specialisation appeared long before steel

was first used as the raw material. As has already been indicated, the bar used in tinplate manufacture was of two kinds—charcoal iron of superior quality, manufactured in the charcoal forges, and coke iron produced in the puddling furnaces. Corresponding to these to-day are Siemens and Bessemer steel. Just as, in the early days, tinplate factories confined themselves to the manufacture of charcoal or coke tinplate, so now either Bessemer or Siemens plate is produced. Along with this specialisation we find an integration of a particular kind. A manufacturer producing Siemens plates either erects a steel factory to supply the raw material, or acquires a financial interest in an existing Siemens steel-works. In this way further economies are enjoyed;¹ the charges of the middlemen (where they existed) are eliminated, the market for the steel product is secure, and the manager of the bar mill is able to devote all his attention to internal organisation.

The best manager is he who, given fixed prices of raw material, can most successfully substitute cheaper methods for more costly ones. In former years the system of long contracts for raw material (tinplate bar) prevailed, and the managers of steel-works confined their attention very largely to internal management. At the present time bars are often made to order. Accordingly the problem of marketing has never been a serious one in this industry. In the tinplate trade, however, market conditions need to be studied very carefully. Most of the consuming countries are far distant, much of the production is for the open market, and, while the total demand for tinplate is steady and continuous, the trade itself is in a considerable degree speculative as far as the individual manufacturers are concerned. Some of the most successful makers in the past were those who observed closely the movements of the market, leaving much of the internal management in other hands.

Changes constantly occur in the relative demands for

¹ More than by those previously existing manufacturers of steel bar and tinplate (See next Chapter.)

different sizes and grades; but provided the total demand is constant, the derived demand for steel bar will not vary. A dealer may place an order (for tinplate) for future delivery while retaining the option of specifying the size of each delivery. If, for example, an order is placed for 10,000 boxes to be supplied at the rate of 1,000 per month, the dealer may retain the option of specifying (within agreed limits) the special size and quality; and he is guided by the state of the market. But while the tinplate maker is not guaranteed a demand for any one size, the manager of the steel-works is not seriously affected by the option.¹ The process of integration is now almost complete, and there exist very few independent firms engaged in the manufacture of Siemens tinplate.

(2) The second kind of specialisation refers to sizes and grades of tinplate. Some makers confine themselves to the manufacture of a few standard sizes, such as oil sizes. Others, again, specialise in "odd sizes," i.e., a group of sizes differing from the standard ones. Manufacturers may specialise upon a number of odd sizes for two reasons. In the first place there may not be a sufficiently large or a continuous demand for one of them. In the second place, it is probable that these makers, having "found their market," gradually adapt their plant to suit the peculiar needs of a variety of sizes. The cost of manufacturing odd sizes is higher than that of making standard sizes; e.g., there is more waste in scrap and in cutting down plates; annealing,² pickling, and cold rolling are more expensive, and more tin is used. Consequently the prices of odd sizes are on a basis of 6d. per box higher than those charged for ordinary sizes. A maker who specialises in the former, having erected suitable plant, would naturally desire to have the extra 6d. on every box

¹ To avoid "playing in contracts," orders are often given for the equivalent of a specific number of basic boxes, for example, 10,000 boxes of 20/14. The merchant may later specify (for instance) 5,000 boxes of 28/20, or 4,000 30/21, either of which would be in completion of contract. The steel bar maker is secure of his order of a definite weight, although he may possibly have to supply a variety of sizes and thicknesses of bar.

² More pots would be required, and different periods in the pots

possible, for in this way the proportionate extra cost would be slightly reduced.

A manufacturer rarely, if ever, confines his attention to one standard size, for there is little to be gained by doing so. Several sizes can be worked in the same set of rolls without change or adjustment, provided they are worked in proper rotation during a given week, after preparation has been made when the rolls are "turned" on the previous Sunday.¹ If different gauges or thicknesses have to be worked the rolls need to be adjusted; but that is not a difficult matter, and the rollerman who is responsible for it can do the work easily and quickly. Nor is there any greater specialisation in the tinhouse. A tinning set may be regulated (by means of pulleys and adjustment of rolls) to work various sizes and grades of plates during the same week. Some tinning sets, however, specialise on certain plates of exceptionally good quality; and in these sets the old method of cleaning is retained, and girl dusters are employed. One may conclude, then, by saying that each mill and tinning set is independent of every other in respect of the advantages of specialisation of output. Generally speaking, little advantage is gained by continuous specialisation upon a particular size or grade. The main economies of large scale production are of a different character.²

¹ Wide plates must be worked first, and the narrow plates last. If the wide ones are rolled after narrow ones their faces are spoiled, because the rolls are worn and the marks appear on the face of the plates. The rolls are "turned" at week-ends to suit the orders to be worked during the following week. Having been turned, the surface is slightly concave or "hollow." Great care needs to be taken that the rolls are not heated too quickly on Monday morning. If the heating is not gradual they expand unevenly and may break or "burst." When resetting it is the custom to use "bar ends", that is to say, pieces of bars too small to be used for producing the sizes ordered, but suitable for another size of plate. Different gauges, too, must be worked at special periods according to the state of the surface of the rollers. For example, thin plates would be worked when the face is practically even, neither concave nor convex, IX, XX, etc., would be rolled near the end of the week. By working the different sizes and gauges in proper order a maximum yield of black-plate is obtained and shearings are reduced to a minimum.

² For a reason which will become evident later the further consideration of the concentration movement is deferred until the effects of dumping have been examined.

THE MARKETING OF TINPLATE

There are probably few commodities manufactured in this country which are so completely standardised as tinplate, so that one of the main conditions essential to the rapid development of marketing is present. Each plate is practically the duplicate of every other marked as of the same quality. The commodity is fully and carefully graded, and a sample is quite unnecessary. The main grades are "ordinary coke," "best coke," "light charcoal," "charcoal," "extra charcoal." The difference between these is not due to any difference in the quality of the steel, but to the varying amounts of the tin used in coating. For tinning common coke rather less than two pounds is used, for the best coke quality a little more is required, and so on. For each grade different brands are employed to distinguish the product of one manufacturer from that of another. Some of these brands are better known and command higher prices than others of the same grade, but the common plate of the grade certified and quoted on the exchange fulfils all the conditions demanded of that grade.¹ The merchant and consumer consequently know exactly what they are purchasing. Tinplates are branded not only by manufacturers, but also by merchants; and the latter are often requested that boxes shall bear their particular brand, although their purchases may be made from several works.

The present highly organised state is but the latest stage in a slow process of evolution. About the middle of the 19th century, although the distinction between charcoal and coke tinplates was recognised, and different grades existed in each class, the market seems to have been in a completely disorganised state. Even as recently as thirty-five years ago private brands were no guarantee of quality, and apparently it was about this time that manufacturers' brands were established. But at first "wasters" were sold under the same brands as

¹ Brands are also used to certify the degree of stamping quality or to indicate special assorting for specified reasons

"primes." Consumers sometimes purchased and used the former when the latter were really needed, simply because they could be obtained of the required brands and at lower prices. This confusion led to the use of the phrase "no wasters," to indicate that boxes contained only plates of guaranteed quality; wasters, unassorted plates, and primes, were classified differently, and no longer sold under the same brands. Moreover, deviations from standard weights were common up to thirty years ago, and it became necessary to brand or stamp "average weights" (and later "actual net weights") upon the boxes. But, provided the plates have been carefully assorted, the merchant and consumer now obtain exactly what they expect to have.

Tinplates are always purchased by merchants "subject to inspection," and those which do not stand the test may be rejected. The merchant employs an inspector at the warehouse at the docks to sample the goods which he has purchased. The inspector usually opens a few boxes from each parcel, and turns every sheet over to see whether wasters are packed and sold as primes. He is responsible for seeing that the plates are of specified size and quality, are clean, bright, of uniform substance and free from defects; that the boxes contain the correct number of sheets, and that they are suitably packed and marked for shipment. "Wasters" are seldom sampled. When testing or sampling plates the inspectors are largely guided by their knowledge of the market for which they are intended.¹ Every merchant employs an inspector at

¹ The test varies with the use for which the plate is designed. All plates are tested for weight, substance or quality, assorting, and finish. A sampler will pass defects in plates intended for China and Japan which he will not tolerate in plates to be exported to Singapore. The latter are used for canning fruit; and in view of the acid properties of the fruit the slightest surface defect renders the plate worthless. Again, plates used for decorating purposes require more metal, and must have a perfectly flat and smooth surface. For the manufacture of this class machine-cleaners are, for this reason, vastly superior to girl cleaners. If (say) 20 in. plates are worked in 30 in. rolls the unworked portion of the rollers becomes rough; and if a larger plate is afterwards worked the effect is clearly marked upon the finished surface.

each exporting centre, and an inspector works for several merchants. When one merchant buys from another rather than from a manufacturer, the two may employ different inspectors; and there always exists the danger that the inspector acting on behalf of the buying merchant will condemn what the agent of the first (who bought from the maker) has passed. Sometimes a merchant buys a certain grade and requests a special and severe examination of the plates; he then endeavours to sell them abroad as plates of a higher grade. It is said that complaints which sometimes come from abroad are partly due to this custom. Merchants and consumers in foreign countries also employ samplers; and complaints are sometimes made of the quality of the plate exported. But some of these, which come from consumers in distant markets, are merely a dodge for obtaining concessions in price. The manufacturer is at a disadvantage; to send a representative to (say) South Africa to examine the goods, or to recall them and pay freight charges each way, would prove too costly; and the manufacturer is sometimes forced to compromise and allow a deduction.

DEVELOPMENT OF THE EXPORT TRADE

The chief ports for the exportation of tinplate are Liverpool, Swansea, and Newport. Competing with Swansea for the plates manufactured in the western area are Llanelli, Neath, and Port Talbot; and competing with Newport for those manufactured in the eastern district are Cardiff and Bristol.

In the early days of the trade Liverpool (and Birkenhead) was the chief exporting centre. The Mersey ports enjoyed a complete monopoly of foreign shipments; for there were regular steamship lines, and therefore convenient boats—especially to the United States, which at this time was the market for the greater part of the product. Tinplates were sent coastwise from the Bristol Channel ports to the Mersey, and there re-shipped. While Liverpool was the chief distributing centre, it

was naturally the home of merchants, and the Liverpool Exchange was of some importance. As time went on the industry developed mainly in the western area, and Swansea became the recognised centre of the industry. It was natural, therefore, that it should make strenuous efforts to become the commercial, as well as the industrial centre. In 1882 the Prince of Wales dock, equipped with modern appliances and machinery was opened; shipping facilities were increased, and lines of communication established with distant parts. Liverpool then declined in importance as the exporting centre, and Swansea rapidly came to the front. Shipments from other South Wales ports also increased, especially from Llanelli and Newport. Tinplate sent direct from South Wales to port of destination, being handled fewer times, is in better condition than that sent coastwise to Liverpool for re-shipment abroad. But even now plates are sometimes re-shipped at Liverpool. There are still places where ships from Swansea do not go. Again, a contract is often due before the first Swansea ship reaches the port of destination. Finally, to some places, boats from Swansea cannot obtain full cargo; and the freight rates are extremely heavy if small cargoes of tinplates are taken. In 1887 (by which year plates shipped from Swansea constituted more than one-half of the total exports) the Swansea Metal Exchange was opened, and soon merchants had opened offices in the town. Thus Swansea became the commercial as well as the industrial centre of the industry.

THE EXCHANGES

The merchant, who plays a very minor part in marketing of steel bar, is an important functionary in the tinplate trade, for the property rights to most of the plates manufactured pass through his hands. As a merchant deals also in other commodities; he is known

¹ Since tinplates are extremely heavy, "bulky" articles are ideal complementary cargo.

as a metal merchant, and buys and sells tin, copper, etc. But tinplate is the chief article. Some manufacturers have secured their market, and deal directly with the foreign consumers. Inquiries are sent directly to the works, and agents of the manufacturers make periodic visits to the markets. The Swansea Exchange is now the hunting ground of small salesmen—those who sell oil, packing, stores, etc.; and very little business in tinplate is transacted. But manufacturers and managers meet there to discuss business matters. Purchases and sales are generally made by telephone and telegraph. The Exchanges at Newport, Liverpool, and London are practically valueless. The London and Liverpool market reports emanate from merchants; their own quotations, rather than the actual prices paid, are indicated, and these are generally a little higher than the actual selling prices. The Swansea market reports are official, and are not issued by interested parties; but even the quotations found there are not more than a rough index of prices.

Quarterly meetings are still held at Birmingham. At one time prices were fixed there for the ensuing three months; but the meetings have lost much of their early significance. They are now gatherings of buyers and sellers for discussion. Opinions are exchanged, and an idea of the trend of the market is gained. But although some sales are effected the importance of the meetings in this respect has been lost. Tinplates are mainly sold by manufacturers to local merchants. The latter sell either directly to the consumers abroad, or to foreign distributing merchants who buy large quantities and sell smaller "parcels" in their own country. American "jobbers" in the old days were distributing merchants; and many such sellers are to be found at the present time in this country—they distribute the plates intended for home consumption.

The McKinley tariff dealt a severe blow to the merchants. While South Wales manufacturers enjoyed a monopoly of the American market, and the United States imported more than one-half of our total production,

buying and selling were chiefly in the hands of about half a dozen Liverpool and London merchants; and these depended almost entirely upon the western market. A change in the character and an increase in the number of foreign markets, together with the growth of Swansea as the commercial centre, has resulted in an increase in the number of merchants; and these do not enjoy the semi-monopoly possessed by the few during those days in which the American market was quite secure.

CHAPTER VII

MODERN ORGANISATION (*Continued*)

THE RELATIONS OF STEEL AND TINPLATE

MARKET RELATIONS

DURING the present century important changes have been made in the organisation of the steel and tinplate industries. Their mutual relations have been entirely altered, partly as a result of foreign importations of tinplate bar. In order clearly to understand the effects of dumping upon the industries it may be well to recall a few relevant facts, most of which have been already discussed in considerable detail. The Welsh industry was first established (in the 18th century) to provide a market for the iron produced in the district; it was in every way subsidiary to the iron industry. A tinplate mill was but an appendage to the charcoal forge or puddling furnace, which manufactured other iron products as well as bars. When, after the middle of the 19th century, steel gradually displaced iron in many uses, the forge grew increasingly dependent upon the tinplate mill, and the manufacture of iron bar became a more important branch. But the two stages of manufacture—the production of the bar and its subsequent manipulation—constituted practically one industry, and few “pure” tinplate works existed. The masters’ association included makers of iron as well as manufacturers of the finished product (generally they were the same people), and the workmen’s union was equally comprehensive; the “1874 list” controlled not only the rates paid to those engaged in tinplate manufacture, but also the wages of the men employed at the forge and furnace.

Between 1879 and 1886 steel was substituted for iron as the material of which tinplate was made—Bessemer bars took the place of puddled iron bars, and Siemens bars that of charcoal iron. The former were obtained from factories originally built for making rails, in which tinplate bars were only afterwards manufactured as an exceedingly profitable subsidiary product. Tinplate makers have never erected Bessemer plant to supply their needs; for the latter requires a blast furnace, and involves a much greater expenditure of capital than does the plant required for the alternative process. Moreover, ever since the owners of Bessemer works turned their attention to the manufacture of tinplate bars, the supply of the Bessemer quality¹ has been sufficient to meet requirements. Since tinplate made of Siemens bar is more suitable for the majority of uses (especially where it undergoes deep stamping and other severe tests), the growth in demand was, and is, mainly for this material; consequently, new Siemens factories were erected in the neighbourhood of tinplate works. Although some of these were built by tinplate manufacturers, the most important were entirely separate. The substitution of steel for iron thus had a disintegrating effect, and the manufacture of tinplate became a distinct and separate industry from that engaged in the production of the raw material, steel or tinplate bar.

The separation of the two sections naturally called for an intermediary. The tinplate bar was placed upon the market, and a new opening was created for local dealers;²

¹ Bessemer (acid) bars are now only used for making galvanised sheets, but those made by the basic process are still employed in tinplate works. Bessemer bars for the purposes of the remainder of this chapter refer to those made by the basic process.

² Strictly speaking, it was the rapid development of trade, the improved organisation of the market, and the progress made in the standardisation of the tinplate bar, rather than the substitution of steel for iron, that resulted in the growth of the merchants. For the relations of the two industries remained almost the same in their essentials. In the days of iron there were, I believe, a few examples of "pure" tinplate works, whose owners bought the raw material (charcoal iron) either by contract or on the market—mainly by contract. The development of trade subsequent to the introduction of steel, and the reluctance of some tinplate manufacturers to substitute relatively expensive steel producing plant in place of their less costly

and where the intermediary was ignored direct contracts were necessary. This state of affairs continued almost without change until the end of the century. Thus, although some tinplate manufacturers from the first made all the steel bar required for their purpose, the majority obtained it from steel factories (over which they had no control), with or without the intervention of a merchant.

During the past dozen years, however, a change has taken place; as will be shown presently the periods of partial disintegration and separation have been followed by a final period of integration; most of the tinplate manufacturers have acquired financial interests in Siemens steel firms, and all the owners of the latter have either purchased tinplate factories or acquired a sufficiently strong interest in them to secure preferential treatment. But some buying and selling of bar is still necessary. The producing capacity of the bar mill is not identical with the demand of the tinplate factory or group of factories supplied; sometimes the one is greater, sometimes the other; and where there is a difference the surplus has to be disposed of, or the deficiency made up. Moreover, some tinplate works are still independent, *i.e.*, those which mainly make use of Bessemer steel, and the diminishing number of small makers who still obtain steel where they can, in this country or from Germany and America.

Although buying and selling are still necessary, a steel maker will not sell through a merchant where it can be avoided, partly because it is much easier to deal directly with the tinplate manufacturer, and partly because it is possible that a careless maker might find himself in direct and unsuccessful competition with the merchant in a

iron works, guaranteed a ready market for the new bar to the enterprising steel manufacturer. Accordingly, a number of steel works, independent of tinplate works, were erected, or, if already existing (as in the case of the *old* Landore Steel Works), were utilised for the purpose. And, although the contract system still retained its popularity with many firms, a larger amount of buying and selling was obviously necessary. Since the immediate causes indicated at the commencement of this note were themselves largely the result of the introduction of steel, the statement in the text represents the substantial truth.

market which he had come to regard as his own. Although this may seem strange at first, that it may prove to be the case can easily be shown. The tinplate industry may be regarded as divided into a number of small groups of factories, each supplied with steel from the bar mill erected in the vicinity¹ of the group; in other words, each of the bar mills has its own group of customers, and in his own market the bar manufacturer may be said to enjoy a partial monopoly. This monopoly naturally becomes complete when the financial interests are completely amalgamated. To the members of a group a uniform price for steel bar is charged. Some of the tinplate works are situated at a greater distance from the steel factory than others, but this makes no difference to the price. The freight charges for the total output are added together, and the average is charged on each delivery. Consequently it is no hardship to a tinplate manufacturer if the factory supplying the raw material is situated some distance from his own, for he can obtain all he requires at the same price (delivered at the works) as his competitor will be required to pay. The bar merchant, on the other hand, buys "free of truck," i.e., at a price lower than that charged to the tinplate manufacturer by the amount of the (uniform) freight charges. If the maker sold indiscriminately to a merchant, the latter might undersell him in the immediate neighbourhood of his own factory; he would sell at a price "free on truck" with freight charges (which, for the short distance, would naturally be less than the average) and his own profit added. This would soon render impossible the system of delivering at one price, and distributing the freight charges uniformly over the output. Consequently the merchant is first asked to state to which works he intends to send the bars. If it proves to be a factory not previously supplied by the particular maker, the product is sold to him; but not otherwise. The merchant therefore performs a useful function by acting as an intermediary, when necessary,

¹ "Nearness" is more a question of time and freight charges than of mileage

between the Bessemer factories and the independent tinplate works, and by removing the discrepancies due to excess of Siemens steel production in one part, and deficiency in supply in another.

The prices of Siemens bars are determined by an association which has been in existence since 1906. Previously, in times of depression, the policy of "dumping" locally was pursued, *i.e.*, a steel manufacturer sometimes sold bars to a tinplate maker outside the "group" at a price below total cost, but above the direct or prime cost of production. Generally speaking, prices were determined by market conditions; and since 1900 these have been periodically affected by importations from Germany and America.

Siemens and Bessemer tinplates are partial substitutes. For some purposes Siemens plate alone is suitable, and a rise in the price of this article would not be followed by an increase in the demand for the Bessemer quality. But in some markets now supplied with the Siemens product the other would not be altogether unsuitable, and a considerable rise in the price of the former would be followed by an increased demand for the latter. Moreover, Bessemer plate is only preferred in certain cases on account of its comparative cheapness; and an appreciable rise in the relative price of this article would be followed by an increased demand for the alternative. Since, then, Bessemer and Siemens plates may be regarded as substitutes in a portion of the market, their prices are mutually dependent—they rise and fall together. And this sympathy in prices naturally extends to the bar, so that anything which seriously affects the market quotation for one influences also the market value of the other. The similarity of long period changes in prices is due to the fact that although the methods of manufacture are different, the raw materials employed are substantially the same.

In practice, the price of Bessemer bar is determined by tacit agreement among the manufacturers. It is regulated by that of the rival commodity, and is fixed at a point so

much below the latter that the relative demands for the two remain constant. But this point of equilibrium is itself determined by the extent to which the two qualities of the article are mutual substitutes.

A Siemens steel-works consists of a number of melting furnaces, together with a bar-rolling mill. In the furnaces pig-iron, scrap, and shearings are melted and converted into steel. The molten steel is then run into moulds, and the rectangular blocks thus formed (known as steel ingots) are passed through the bar mill and rolled into sheet and tinplate bars of the required gauge (*i.e.*, thickness, or weight per foot). These, when cut to the sizes required, are delivered to the tinplate and sheet works, where they are employed as "raw material." The Siemens steel factories of South Wales are highly specialised. Although rails are made in a few, the main (in most cases the only) product is steel bar. Some makers supply such bars to sheet-steel and galvanised-sheet manufacturers in the Midlands, but they depend mainly—and the remainder depend wholly—upon the South Wales finished-steel industries for their market. A tinplate factory consists of two main branches, the rolling mills and the tinhause. In the former the bar is rolled into thin sheets, which are cut to the required size. In this state they are called "blackplate," while the strips cut away, which are returned to the melting furnaces in the steel-works, are called shearings. The blackplate is coated with tin in the other department and prepared for the market. In some tinplate factories sheet mills (similar to, though larger than, the ordinary rolling mills) have been added, and in these the bar is rolled into sheets which are useful for some purposes without further preparation. Again, tinplate factories are easily convertible into a form suitable for the manufacture of galvanised sheets, and some have been turned to this use in recent years. Thus, in three closely related trades of the metal group three articles are produced which, within very narrow limits, compete with each other. Moreover, since there is little difference between bars from which steel and galvanised

sheets are made, and those employed in the manufacture of tinplates of common quality, all three compete for the imported bar. No returns appear to be given of the quantity used in each trade, but since the tinplate industry is much larger than the others in South Wales it naturally provides the largest market.

A tinplate factory contains several rolling mills, from eight to twelve being fairly representative. A steel-works, on the other hand, generally contains but one bar mill; and whether the latter is fully utilised depends upon the number of melting furnaces which feed it. A well-equipped modern bar mill is capable of producing about 2,250 tons of bars per week, while the normal output of a tinplate mill in the same time is about 40 tons. One such bar mill can therefore keep fifty¹ tinplate mills adequately supplied with material. There are roughly between five and six times as many tinplate factories as there are steel-works. At the beginning of the present century, when foreign bars were first dumped into this country, there existed but little real competition between South Wales steel producers; each supplied a fairly secure market, and although there appeared to be no price agreement the conditions in normal years, as already indicated, approximated to monopoly, even where there had been no "vertical integration."

German and American steel-works, from which sheet and tinplate bars were sent to this country, are not so highly specialised. They resemble the Bessemer factories of South Wales and the Siemens and Bessemer works of England and Scotland; and, normally, rails, girders, etc., form the chief products. But by simply changing the rolls in the mills bars for galvanising and plating purposes can be made. If orders for (say) rails are not forthcoming in sufficient quantities to keep the mills fully

¹ The arithmetical calculation seems inaccurate. But I indicated the maximum output of the bar mill and the normal output of the tinplate mill. Obviously allowance must be made in the output of the former for stoppages of furnaces for repairs, etc. This has been done in the latter. Relatively few of the steel-works actually at work possess the producing capacity indicated.

employed, they are held back for a time, and bars are rolled and sold abroad on a basis of prime cost.¹

DUMPING OF TINPLATE BAR

In 1900 the monopoly hitherto enjoyed by Welsh steel manufacturers was endangered, and tinplate bars were imported at prices which bore little reference to the cost of manufacture. Dumping of this character has continued at intervals up to the present, although most of the foreign supplies during the past four or five years have been necessary to the progress of the tinplate industry. Welsh supplies generally fall short or run ahead of requirements. The first bars were sent over from Germany, and were of the Bessemer quality; but when, in 1904, German makers

¹ This suggests that the prevailing opinion regarding dumping is not wholly true. It is commonly believed that the dumped commodity is sold abroad in order to maintain higher prices in the producing country. But in this case the exported bars were manufactured for the specific purpose of exportation, and in a sense it is probably true to say that the home market was not affected. Some one may urge that if the bars had not been exported they would have competed in the home country with those normally produced there. This is purely a matter of conjecture. But it should not be forgotten (a) that probably the normal production of bar mills is in excess of requirements during a period of depression, and prices may be already as low as excessive competition can send them; and (b) that steel makers select one of a number of products, and if the foreign markets were closed they would produce that class in which depression was least severe and prices relatively high. Whether sheet and tinplate bars would be selected depends therefore upon the prevailing conditions. It is certainly true that German bars, so far from being an "accidental surplus," were manufactured deliberately with a view to exportation, in factories where other classes of steel goods formed the normal product. In America the conditions were somewhat different. The United States Steel Corporation, which apparently produces the greater portion of the dumped bar, controls a large proportion of the production of nearly all classes of steel goods. It produces semi-manufactured steel as well as tinplate. Consequently prices of bars are controlled by the same authority as that which determines the class of steel to be produced. In Germany, on the other hand, the Kartel apparently fixes the price of tinplate bar, while the individual member, who, under normal conditions, may manufacture no bars, decides whether he will produce them for export during depression. And the Kartel price is not affected by his decision, although the latter is possibly a factor increasing or lessening the difficulty of enforcing the price agreement in the home market.

retired for a time from our market, considerable quantities of American bars made by the Siemens process were imported. Since the depression of 1907-8 (which scarcely affected the volume of production in the tinplate industry), German, American, and Belgian bars have been dumped at irregular intervals and in varying quantities. During the first period of dumping London agents of foreign producers travelled South Wales, and sold to the highest bidders bars which had already been shipped to this country on the chance of finding a market; but as trade increased orders were accepted for future delivery.

Imported bars have usually been sold on the Welsh market at prices varying from 7s. 6d. to 15s. per ton (generally about 10s. or 10 per cent. below the modal¹ price) lower than those ruling for the home manufactured article, so that at first they were disposed of without much difficulty. But they were not so cheap, relatively to the home product, as they appeared to be. The purchase of the imported article was (and is yet) a different kind of transaction from the customary one on the steel market; purchases were made at "buyer's risk," and payment was required on delivery of goods; complaints were therefore useless and redress was impossible. Moreover, supplies were sent to this country without any reference to the actual needs of prospective buyers. They were generally of the standard size, and sent over in large parcels; consequently they suited neither makers of odd sizes nor those who made a considerable number of standard sizes. For not only were the specifications of such makers extremely varied, but the separate orders were so small that they received no attention from the foreign producers of the raw material.

Again, the quality of the imported bars was at first so poor and variable, and the gauges varied so much, even in small parcels, that they were only suitable for

¹ By "modal" I do not mean either normal or average, but rather that price which corresponds to the greatest ordinate of a frequency curve. The phrase is used to imply the price characteristic of the period under consideration.

conversion into plates of common grades. They were difficult to manipulate in the mills, and breakages of machinery were frequent. The quality (especially of Siemens bars) has now improved, but even to-day some purchasers of tinplate stipulate that the article which is supplied to them shall be made from British steel.¹ Moreover, when contracts were made for foreign bars there was no guarantee of prompt delivery, and often during busy periods tinplate makers found it extremely difficult to obtain bars in fulfilment of such contracts. Finally, foreign manufacturers required a larger margin in the rolling weight. Since this was a much more serious disadvantage in tinplate manufacture than in the making of steel and galvanised sheets, the imported bar was better suited to the latter use. But although dumped bars were not so cheap as they appeared to be, nor so suitable as the home product for tinplate manufacture, they were undoubtedly useful, and relatively cheaper to those tinplate makers who confined their attention to standard sizes and ordinary grades.

The effects of dumping were far-reaching. (1) The monopoly hitherto enjoyed by Welsh steel manufacturers was destroyed. Previously they had been able to dictate their own terms to their best customers, the tinplate makers. Often they supplied the latter only with those sizes which could be made without inconvenience, and in quantities which best suited themselves. And this policy naturally proved a great hardship to the smaller tinplate manufacturers. Since they were compelled to purchase in quantities far in excess of their requirements, their credit was severely strained—more capital was required to carry on the trade, and interest charges were heavier. The surplus stock, too, was slowly oxidised through long exposure in the yard, and its value reduced. Moreover, since the bar makers supplied those sizes convenient to themselves, the waste of steel in the production of plates

¹ The *quality* of a tinplate may be discovered by a simple test, but it is impossible from this to trace its origin. Consequently the merchant is forced to accept the word of the manufacturer.

was considerably increased. In short, not only were the conditions of manufacture somewhat irritating, but the cost of production was higher than it need have been. When the monopoly was destroyed Welsh steel manufacturers were compelled to change their methods. They accepted orders for small quantities, and willingly supplied bars of the qualities and gauges required.¹

(2) The second immediate result was a reduction in the prices of steel bar. The market for this commodity was often seriously affected by the under-selling of German bars. It is true that the latter were sent over in relatively small quantities, and that the total excess of supply was inconsiderable. But there is no close and obvious arithmetic relation between the extent of over-supply and the amount of reduction in price; a small over-supply may be² followed by a heavy fall in prices. And this was true of the early days of dumping.

The offer of small quantities of foreign bars at lower prices often forced local steel manufacturers to reduce the prices of their own bars very considerably. Nor did this prove to be so great an advantage to the tinplate manufacturers as is commonly supposed. For the smaller firms played into the hands of the merchants. They were accustomed to work with as little capital as possible and as much credit as they could obtain; they relied upon imme-

¹ Some bar manufacturers tried to prevent the purchase of foreign bars by stipulating that the shearings which were bought from tinplate makers should be of Welsh bars only; others accepted shearings obtained from imported bars, but only at a price about 30s. a ton below that paid for shearings from Welsh bars. But it was obviously impossible to distinguish between the two, careful analysis would only indicate quality. Moreover, such analysis was not worth the cost. They were consequently forced to rely upon the honesty of the tinplate makers.

² And will be where production involves the employment of much capital, *i.e.*, where the standing charges are heavy and prime costs relatively small. In such cases the producing unit is large, and, consequently, a relatively small number of units can supply the market. Thus the need for the elimination of competition and the substitution of some form of combination or association seems to vary directly with the probability of success in creating it. The Siemens steel industry in South Wales provides an excellent illustration of this.

diate sales and early payment for capital to continue in operation. When dumped tinplate bars appeared in this country the merchant made use of the low prices at which they were sold to "bear" the tinplate market, and the prices of the manufactured product followed those of the raw material; in other words, the merchant rather than the manufacturing class gained most by the fall in the prices of steel bar.¹

It should not be forgotten that the small makers of tinplates suffered in two ways. Usually they sold to merchants, and suffered from a fall in market prices. But they did not, as a rule, succeed in obtaining dumped bar; and they only benefited to the extent that foreign importations resulted in a reduction of prices of Welsh bars. German and American bars—especially the latter—came over in shiploads² or in large "parcels," and, since they were also sold for cash, were generally disposed of to large buyers.³ The latter, on the other hand, were less dependent on the merchants. Their market was more secure, and their prices for tinplate varied less than market prices. Production was less a matter of speculation and more in response to demand directly from customers abroad, and in fulfilment of contract. Consequently,

¹ The following evidence, given by a witness before the Tariff Commission, is probably true in the main. "The tinplate trade is a rather peculiar one, because from financial conditions, and from the necessity of distributing the tinplates far and wide, the trade has got into the hands of merchants, and the merchants buy the tinplates out and out, and I should think the greater part of every firm's production is sold to merchants in that way. Therefore the merchants have a considerable hold on the prices. Whenever foreign bars have been threatened, or whenever foreign bars have been offered at below Welsh prices, the merchants have ceased buying and the fall in price of tinplates has been much more than the fall in price of the raw material. And I think that for that reason, if there were more stability in the steel bar prices the tinplates would be permanently higher than they have been" ("Tariff Commission Report," page 874.)

² Not until the summer of 1911 did American shippers accept less than a full cargo of bars.

³ The larger manufacturers who purchased foreign bars were also those who owned steel-works; apparently they sometimes sold at the Association prices bars made in their own works, and utilised dumped bars in their own tinplate factories.

those makers who benefited least by dumping appear often to have suffered most from the resultant fall in prices of tinplates.

Although prices to tinplate merchants were reduced, consumers who purchased from them did not always benefit; for, just as some large consumers in foreign countries made contracts with manufacturers without the intervention of merchants, so, too, did other consumers make contracts with merchants; in other words, while the tinplate market is highly organised as between manufacturers and merchants, it is not so highly developed as between merchants and consumers, and wide variations in prices charged to consumers may exist.

Moreover, even if prices to consumers had been proportionately reduced, the reaction on trade would have been extremely slight; for the long period demand for tinplate (as distinct from market demand) is highly inelastic within fairly wide limits of price. Thus it seems absurd to argue, as many have done, that the prosperity of the tinplate trade in recent years was largely due to importations of bar at low prices. It is undoubtedly due to the increased use of tinned food, etc.; and the effect of slight variations in the prices of tinplates upon the prices of and demand for tinned goods was negligible.

The destruction of the bar monopoly was undoubtedly an advantage to tinplate manufacturers, but an advantage purchased at considerable cost. Dumping occurred at irregular intervals, and the quantities imported varied considerably; consequently, violent and unforeseen fluctuations in prices took place, market conditions became more unstable, and contracting for future delivery more difficult and risky.

(3) Undoubtedly the most important effect of dumping has been to hasten the process of integration in the steel and tinplate industry. Until about six years ago the two stages of manufacture formed quite distinct businesses, but now the production of Siemens bar and the manufacture of tinplate constitute practically one industry. In 1905 the Americans exported considerable quantities of

Siemens bar to this country, and Welsh prices were extremely low. But at the end of the year dumping practically ceased, and the market improved. A few months later (1906) the South Wales Siemens Steelmakers Association was formed¹ for the purpose of raising and regulating Welsh prices; and the conditions of manufacture and trading were so favourable that its efforts were largely successful for a time. There are but few makers and the number is not likely to be increased very considerably. For, as already indicated, steel production involves a considerable expenditure of capital; the producing capacity per unit is large relatively to the total demand and a few factories can produce all the bars required.

Late in 1907, however, foreign bars once more appeared on the Welsh market, and more than one local steel manufacturer was in a position of some difficulty. The easiest way out of this difficulty was to secure preferential treatment and a market for the bar by acquiring financial interests in tinplate factories.

This policy has now been carried out everywhere, and to-day there are practically no Siemens bar manufacturers who are not also financially interested in tinplate works, and very few Siemens tinplate makers who are not shareholders in steel manufacturing companies.² But it should be observed that the process of integration would have gone on—at a slower rate, perhaps—even if no dumping had taken place after 1906. It was the inevitable consequence of the formation of the Bar Association.

¹ Mr. Macrosty states that an earlier attempt was made (1905) to form an association "to maintain prices, but it only lasted a month when one firm withdrew and prices at once relapsed to their former level." This attempt followed a short period of suffering "from the high price of pigs and the competition of West Coast Steelmakers."

² The movement still continues, but a few tinplate makers remain independent. They now complain that during brisk periods they are left out in the cold and cannot obtain steel, and the question of erecting a steel factory for supplying them with the raw material was actually discussed. Bar makers naturally supply those works in which they are financially interested before they sell to the outside manufacturer. The importance of a steady supply of steel of guaranteed quality made the average tinplate maker ready to join the movement towards amalgamation.

For although the latter controlled prices, it made no attempt to control output. While the steel manufacturer could not sell in the open market at a price below that fixed by the association, there was nothing to prevent him from erecting additional melting furnaces, and in other ways increasing the producing capacity of the factory. And the high prices fixed by agreement naturally induced him to do this, and to guarantee a market for the whole of his output by purchasing or combining with a sufficient number of tinplate firms.

We arrive at the conclusion that dumping of tinplate bar has affected very materially the organisation of the steel and tinplate industries. It provided a strong incentive to the formation of the Siemens Bar Association, although the conditions of success of the policy of the association were largely independent of it. And in this way it hastened the process of vertical integration. But the condition of things created by dumping¹ would inevitably have appeared sooner or later, for steel manufacture was an extremely profitable industry. And probably it would have appeared long before if the development of the sheet steel and galvanised sheet industries, as well as the remarkable growth of the demand for tinplate, had not provided a constantly expanding market for the raw material. The strongest incentive to combination lay in the over-stocking of the steel market during a steady growth of the finished-steel industries. In view of the greatness of the size of the steel factory (or in other words the smallness of the number of steel factories required to supply the market) such a result would undoubtedly have followed even if no foreign bar had been imported. And the consequence of the elimination of competition in the steel market would be vertical integration. Thus it may be said that the dumping of bar and the extremely rapid growth of the demand for the final products were forces operating in opposite directions and tending to neutralise each other.

¹; e., repeated over-supply of sheet and tinplate bar, and keen competition in face of a steadily increasing demand.

The situation to-day presents features of interest. The Bar Association appears to be a successful experiment; prices are fixed by agreement, and one form of competition seems to have been eliminated. But in reality steel manufacturers are competing in the next stage. Large firms controlling both stages of production will often sell tinplates without profit, and, if necessary, erect new tinplate mills, in order to secure a market for the steel at prices fixed by the association. Nor is this all. In steel manufacture a strong tendency exists towards an increase in the size of the factory. For the economies of large-scale production are more pronounced here than in the industry with which we are mainly concerned. This reacts in turn upon the number of tinplate mills within the sphere of influence. Hence we find that for three or four years keen competition resulted in an enormous increase in the producing capacity of each of the two main industries. And this fact constitutes one of the causes of the depression now (1913) prevailing in the trades.

THE MOVEMENT TOWARDS COMBINATION

The question naturally suggests itself: How far will the movement towards monopoly or combined action go? This section will be devoted mainly to a consideration of the factors upon which the answer must depend. It will be remembered that all attempts to regulate prices and output in the tinplate industry failed, most of them completely, one partially. There appeared to be too many factories in existence to permit of enforcement of an agreement not acceptable to all. It has become almost a truism that in any industry the control of prices over a long period is likely to be successful only if two conditions are satisfied. The first, it is said, is that the competing firms must be fairly equal in strength. If great variation exists, in most cases the more profitable course for the majority of makers is to allow keen competition upon an over-stocked market to continue until the

weaker firms go to the wall. But, although this is generally true, it admits of exceptions. If much capital has been invested in each business, not only will the resulting prices be extremely low, but the lasting power even of the weakest firms is relatively great. And where this is the case the more profitable course may be to form some kind of combination for the regulation of prices, close the badly equipped factories and compensate the owners. Consequently, the need for combination depends upon the lasting power of the weakest competitor rather than upon the relative strengths of the competing members of the group.

The second condition is that the number of actual and potential competitors must be small enough to admit of successful enforcement of the price agreement. The corollary is that combinations are generally successful in highly capitalistic industries, *i.e.*, where the producing unit is large, and relatively few firms supply the market. It is argued that where little capital is needed, entry to the trade is so easy that a price agreement would be followed by the erection of new factories. This is only partly true. Such a result would undoubtedly follow provided an adequate supply of labour were available. But during periods of expanding trade and high prices, when the inducement to enter the business was strongest, the main difficulty in highly skilled trades would be to obtain a sufficient supply of the requisite kind of labour. A period of experiment and training would be necessary, during which cost of production would obviously be higher than the normal cost for the industry. Consequently, the attraction of capital to the trade would be diminished to this extent, and the position of the combination strengthened. Mr. Macrosty, in 1907, wrote: ". . . For combination there must be some equality between the units. To propose an amalgamation of all the South Wales tinplate works would be like asking a turbine steamer to combine with a dodo. . . . The number of manufacturers in the tinplate industry is still too great, their circumstances too diverse, and their interests too

discrepant for effective combination to regulate their industry.”¹

Again, Professor Levy, writing in 1909, stated that “even if a combination were to be formed, it would probably only attract fresh competition in view of the resulting rise in price. For trained workers, who are of the first importance in the tinplate industry, are abundant in Wales; and fresh tinplate works make relatively small demands on capital, so long as machinery is of less importance than manual labour and as new undertakings can be formed in times of prosperity as tinplate works pure and simple.”²

It is undoubtedly true that under the old conditions any form of combination for the control of prices was beyond the range of possibility. The firms were so numerous that no scheme could be devised for compelling observance of a simple price agreement, or for securing complete financial control by a trust. But the lasting power showed even by weak firms during periods of depression would have made such a combination desirable to the majority, even if such combination involved relatively heavy over-capitalisation. Nor were the “circumstances” so “diverse” or the “interests” so “discrepant” as Mr. Macrosty suggests. The industry is so strongly localised, and its products so completely standardised, that it is difficult to recall another producing highly manufactured goods in which the interests of the manufacturers are so largely identical. Moreover, the immediate danger of new competition has been over-emphasised by Professor Levy; for, as already stated in the last chapter, the labour difficulty is a real one in times of rapid expansion; while the fear of outside competition is practically non-existent during periods of depression and relatively low prices.³

¹ “The Trust Movement in British Industry,” pp. 74-5.

² “Monopoly and Competition,” pp. 206, 207. In 1911, when the book was translated into English from the German, the development of the industry was being seriously hampered by the difficulty of finding skilled workmen for new undertakings!

³ Even a strong combination would obviously reduce prices during

The possibility of combined action increases as the industry becomes more "concentrated." The process of concentration may relate to (a) area; (b) the number of factories and mills; (c) the control of the various stages of production; (d) the number of trading firms; (e) the number of trading firms enjoying complete financial independence. These aspects of concentration call for examination.

(a) The tinplate area is strictly limited; and the tendency up to the present has been for the limits to be more clearly defined. The industry is growing much more rapidly in the district between Llanelli and Port Talbot than in Monmouthshire. Thus one pre-requisite of concentration—personal acquaintance, common business relations, widely-spread knowledge of the conditions of the trade, and dependence upon similar factors—is present. Moreover, the commodity is so highly "standardised" that the fixing of relative prices would not present serious difficulty.

(b) It is not easy to obtain figures indicating to what extent concentration has proceeded in this direction. Concentration is a relative term; if the number of factories remains unchanged while production increases, or increases more slowly than output, it may be said that the industry is becoming more highly concentrated. Nevertheless, the actual number of firms, rather than the number of firms or factories relatively to the market is the real index of the possibility of combination. We know that the number of factories has diminished. In 1885 there were ninety-five in existence.¹ During the boom

depression. It is not essential to the success of a price-association that prices should always be high. It is sometimes argued that the Siemens Bar Association is a failure because the price of bars fixed by it varies with the state of the market, and is relatively low when demand is unsatisfactory, or keen competition with imported bars prevails. This is not so. The test of success is to be found in the following questions. Is the association price higher than a competitive price would be under the prevailing conditions? Is the agreement successfully enforced upon all the members of the Association? Does the Association control so large a percentage of the output that the relatively high price has not resulted in a disproportionate fall in demand from the manufacturers subject to the agreement?

¹ Flower

of 1890-91 nearly 100 were actually in operation. But we are told that to-day there are only eighty-two or eighty-three normally at work.¹ Thus, in spite of the enormous development of the trade since 1885, fewer works exist. Concentration has been due to an increase (1) in the number of mills in the vast majority of factories, (2) in the producing capacity of each mill. The extent of concentration is best indicated by the increase in the daily output of the representative mill. There are three main reasons for this increase. In the first place, the efficiency of the mills erected since the process of integration became well-marked is greater than that of the older ones. The standard size of tinplate is 14 in. × 20 in. At first, 14-inch rolls were erected, and plates were rolled "single-width"; then 28-inch rolls were introduced, plates were rolled "double width" and cut in two, so that the output of the mill was doubled with little additional expenditure of labour. But some of the rolls in the newest mills are 42 in. long, and plates are rolled in three widths. In the second place, improvements in the driving machinery have increased the normal output of the older mills by reducing the number of forced stoppages. Finally, the custom of restricting output was abolished in 1902. About 1865 the customary daily output was twenty boxes per day of twelve hours, afterwards it was increased, first to twenty-five, then to thirty; and finally to thirty-six boxes per shift of eight hours. About the year 1900 the "occasional" forty boxes became the customary daily output.² Thus the output per shift steadily increased, while the number of shifts per day was changed from two to three. Since the time when the labour associations agreed to the policy of "following the machinery," improvements in the plant have become effective, and the output has enormously increased. Now the average is probably over fifty boxes, even including those special sizes and peculiar qualities which are pro-

¹ Evidence given by Mr. Clement before the Industrial Council during its inquiry into Industrial Agreements, 1913.

² With the consent of masters and workmen. This was the first recognition of restriction of output by the masters.

duced with greater difficulty than those of common quality. Seventy boxes (of the ordinary grade) per shift are sometimes produced.

Concentration is not confined to the mills. Improvements have also been effected in the tinhouse. The number of tinning sets relatively to the mills has probably not changed much. Generally speaking, there are three "sets" for every two rolling mills; and this proportion has apparently remained practically constant for many years. Thus improvements in the finishing department have enabled it to keep pace with the mills. It will be evident that concentration in relation to factories is due more to the increased power of the representative mill than to the greater number of mills in the typical works. Efficient management and other economies apparently favour a factory containing twelve mills, although some contain more.¹

(c) It has already been shown that one result of the formation of the Siemens Bar Association was concentration of this character.² Tinplate firms retain the appearance of independence and still enjoy complete autonomy in all matters except the purchase of raw material. But the interlocking—one might almost say the fusion—of financial interests has resulted, in effect though not in form, in the creation of a relatively small number of large business firms, each controlling a steel-works and a number of tinplate factories. It is, of course, impossible to state exactly the manner in which this has been brought about. In some cases the separate firms seem to have acquired interests in the dependent firm; in others shareholders with controlling interests have done so.³ But whatever the character of the combination may be, the effect has certainly been to secure preferential treatment to the affiliated tinplate firms as well as to the steel firms.

¹ They often appear in multiples of four. Eight was once a common number—four on each side of the "fly-wheel."

² This process is more often called integration.

³ Examples come to my mind as I write; but for obvious reasons they cannot be given.

In some cases, as already indicated, the same trading firms have always owned factories in the two stages.¹ It is by no means certain that the control of the two stages was a real economy in all cases. It is true that the cost of marketing was eliminated, and that in most cases transport charges were reduced.² But, on the other hand, a considerable disadvantage lay in the fact that the enjoyment of the many economies resulting from the manufacture of steel on a large scale involved the erection of plant capable of supplying a number of tinplate factories with all the bars required. Hence the steel-works owned by a tinplate manufacturer, while being determined by the number of tin mills under his control, was generally smaller than those of steel makers producing for the general market. And the cost of manufacture of bars was therefore higher. It is probably true that in some cases the cost was at least as high as the market price of bars. Consequently a movement towards large scale manufacture of a special character became evident, *i.e.*, some tinplate manufacturers owning steel-works either added tinplate mills or erected an additional tinplate factory in order to facilitate the enlargement of the steel-works and enjoy the resulting economies. Thus, in order fully to understand the movement towards the manufacture of tinplate on a large scale, it is necessary to examine (in those cases where the two stages were under single control) not only the saving effected in a large tinplate factory but also those effected in a large steel-works.

(d) In 1906 the number of firms was still too large to admit of successful combination. But there were fewer firms than factories, for some of the former owned two

¹ Messrs. Richard Thomas & Co., the largest firm in the trade, and the Forest and Worcester Steel and Tinplate Co. are excellent illustrations. Messrs. Gilbertson & Co. are an example of a firm owning steel and galvanising works.

² Although this is obviously a matter more of physical than of financial relations, except in so far as the freight charges were evenly distributed over the total output of the steel factory, irrespective of destination. But in such cases the cost of marketing had been eliminated, for they implied direct contracts for the supply of bars.

or more of the latter. At that time the process of vertical integration 'had not proceeded far.

(e) The number of trading firms in the tinplate industry has not altered materially since 1906. But, as already indicated, the character of most of them has undergone considerable change. They carry on most departments of business under the old conditions, but they have been brought into closer relation with steel manufacturing firms. And the possibility of combination depends upon the number of completely independent firms, with but a negative relation to each other. To-day, not only do the members of a particular group depend upon a common source for raw material, but a close financial relation exists between each and the firm supplying that material; in other words, the relations between the members of a group are different from those between two firms belonging to different groups. A definite positive relation exists between the former; there is a greater degree of "community of interest" than among the latter; an element of continuity of control exists in the one case which is absent from the other. The importance of this fact can scarcely be over-estimated. For to-day the question of price control has come within the range of business politics. And it will not be surprising to find a serious attempt being made (when the existing depression is over) to regulate prices by combined action on the part of the manufacturers. The Siemens Bar Association may easily become a bar and tinplate association. It is important, therefore, to estimate the chances of success of an effort in this direction.

The counteracting forces call for examination first. The erection of new factories is a simple matter, and entails a relatively small expenditure of capital. Again, since, in a portion of the market, Bessemer plate is a satisfactory substitute for Siemens, and a supply of Bessemer bars could be obtained from British manufacturers, indirect competition would appear unless an agreement were made with Bessemer steel manufacturers definitely limiting the production of bars. Furthermore, German and American

makers would be encouraged to export Siemens bars to this country, and new tinplate firms, depending upon imported raw material, might be called into existence. Under present conditions complete dependence upon imported bar involves too serious a risk, for, as already stated, imports are irregular, and are likely to be least when the need is greatest.

On the other hand, since the demand for tinplate is inelastic the benefits to be derived from a price association are considerable. Moreover, the labour difficulty is so serious that a considerable period would elapse during a period of prosperity before competition would become effective, while a strong incentive to erect new factories during depression would be lacking. Again, the development of a steady import trade in bars (*i.e.*, a trade independent of fluctuations in demand in the exporting country) would involve time, since it would necessitate either an increase in the producing capacity of the foreign steel industries or the adaptation of existing factories to meet the new demand. Finally, the risk involved in the purchase of the raw material from abroad is not inconsiderable. It has been indicated that the quality of imported bar was at first much inferior to that of the home product. The difference in our favour is not so great now. much of the American bar is quite as good as our own. But it is more variable, and the risk attaching to complete dependence upon the foreign material would be serious enough for some time to limit the manufacture of tinplate to the common grades. The guarantee which each grade carries with it is so definite that for the better qualities it is necessary to obtain a uniformly good supply of bars. This would probably prove a temporary difficulty only. For the quality of American pig-iron imported into South Wales is so good that there seems to be no reason why an equally satisfactory supply of tinplate bar should not be procurable. Apparently one of the difficulties experienced in the use of American bars here is that their subsequent manipulation is not quite the same as in the country where they are produced. Nevertheless, while

the difficulty lasted the direct competition would affect the ordinary grades only. Other grades would be affected indirectly, to the extent that the several grades are mutual substitutes. It may be concluded, therefore, that a strong combination would be able to exercise considerable influence over prices for a time. Nor does this conclusion call for modification in view of the possible competition of American tinplate manufacturers. For by charging differential prices the American market could be retained with less difficulty than at present.

Probably the greatest difficulty would be encountered in the process of formation of a combination. Manufacturers are often willing to join an association provided a loophole of escape from the agreement exists. The history of the tinplate trade in the eighties illustrates the truth of this statement. The Siemens Bar Association provides another example. Steel manufacturers made a price agreement and then proceeded to seek indirect means of breaking it! And the ease with which the agreement is now enforced is due to the possibility of escaping its effects by transferring the real competition to a subsequent stage and selling the finished product at lower prices! In view of the difficulty of breaking a tinplate price agreement when the interests of the firm conflicted with those of the association, it is extremely doubtful if even those steel manufacturers who are now members of the Bar Association would consent to an extension of control. The only alternative is complete financial amalgamation, and the formation of a trust upon the American model, controlling the two stages of production. And since some tinplate firms produce sheet steel, and some steel firms supply galvanising works with raw material, these industries would also be affected. That such a trust will not be created in the immediate future is evident to all acquainted with the trades. Nevertheless, in view of the severity with which the "combination fever" has attacked British manufacturing industry, the question of controlling tinplate prices by some means or other is likely to receive attention in the near future.

Too much importance should not be attached to the failure, early in this year (1913) of an attempt (confined to the tinplate industry)¹ to form an agreement for the purpose of keeping output well below the limit of producing capacity until the depression should come to an end. It has become a tradition in the trade that loose agreements of this character are doomed to failure; and manufacturers fight shy of them, for reasons already given. Nor, on the other hand, should the agreement under which all the works are closed for the first week in August of each year (which has been in force for six years) be regarded as the first stage in the development of combination. For this is an arrangement made between masters and workmen; it is but a clause in the annual wage agreement, drawn up by the Conciliation Board.² It is an annual holiday to the workmen, and its operation is quite unrelated to the state of trade. Moreover, it is operative in all the factories, not only in those controlled by the Masters' Association; and the success with which it is enforced is due to the strength of the labour organisations, which, as will be shown later, compel the observance of the trade agreement in all its forms by all the employers in the trade. Consequently, it is the successful Masters' Association rather than the particular condition of employment referred to, which should be regarded as the first step towards co-operation upon all trade matters. And, strange as it may seem, the formation of the Siemens Bar Association must be regarded as the second step.

Recent changes in the organisation of capital have profoundly affected the chances of success of united control by reducing competition within much narrower limits. But the danger of outside competition is so great in spite of the difficulties indicated that, in the long run, a com-

¹ One suspects that the difficulty of forming an agreement this year was to a small extent due to the amalgamation of financial interests of the firms in the two stages. Steel makers naturally exercised considerable influence. And they would scarcely be likely to favour price control of a loose character in the tinplate industry. For such control would abolish the power they now possess of evading the undesirable consequences of the Siemens Bar Association.

² See Chap. IX.

bination cannot hope to do much more than exert a steady influence upon prices.

NOTE (March, 1914)

Since this chapter was written an event has occurred which calls for comment. A few weeks ago the first step was taken towards the formation of an association of manufacturers for the control of output, if not directly of prices; and it is likely that it will soon exercise considerable control over the industry. The new movement is the natural outcome of the events already described.

Last year, in spite of general industrial activity and high prices, the tinplate trade suffered from a period of severe depression, and for some weeks more than 20 per cent. of the mills were said to be idle. Some of the causes of the depression operated on the side of supply, the remainder on the side of demand. In the first place, as already stated in the text, the producing capacity had been rapidly increased, mainly through the erection of a large number of new mills after the process of integration had become well marked, but partly on account of improvements in the driving machinery and an increase in the average output per mill.

In the second place the demand for tinplate fell, mainly because the Balkan War had caused the Roumanian and other markets in the near east to be temporarily closed. But interest was mainly directed towards the American market. About three years ago the rebate orders from the United States, and shortly afterwards the Canadian orders, were lost to Welsh manufacturers. At that time they were less remunerative than those which were accepted from other customers, and the latter were sufficient to keep all the mills fully employed. In the United States, on the other hand, both the steel and tinplate trades were suffering from over-production. In previous years "surplus" bars had been dumped into this country. But during the period under consideration they were converted into tinplates for sale at home and in

Canada. The policy of dumping tinplates into Canada and competing for the rebate orders was apparently encouraged by the workmen, who, it is said, accepted large reductions in wages when working such orders. When, in the autumn, the demand showed signs of returning to its former level, prices were slow to respond, obviously because the producing capacity was in excess of normal requirements. It became necessary, therefore, to assist in the recovery of the market by restricting output; and the new combination is being formed to this end. The problem of controlling prices is inseparable from that of controlling output.

The probability of an early depression, to be followed by combined action on the part of manufacturers, was indicated in a paper read before Section F of the British Association at Dundee, in September, 1912. The substance of this paper was afterwards published as an article in the "Economic Journal" of June, 1913.¹ In a footnote to that article the following occurs:—

"It is extremely likely that demand will soon be greater than ever before, and when prosperity returns it will not be surprising to find a serious attempt being made to control prices by combined action on the part of the manufacturers. The Siemens Bar Association may easily become a bar and tinplate association."

It is probable that some manufacturers will soon be members of three associations, namely, those controlling the tinplate trade and the galvanised sheet trade, together with the Siemens Bar Association. And the probable inter-relations of these three in the future provide a subject of considerable interest, especially to those who have paid attention to the developments in the corresponding industries in Germany and America.

¹ And most of it has been incorporated in this chapter

CHAPTER VIII

ORGANISATION OF LABOUR

THE EARLY UNIONS

It has already been shown that at the commencement of the period covered by this investigation, the conditions of labour, determined mainly by the custom of the district, were anything but uniform. The hours of work were in some places eight and in others twelve per day. Wages rates varied from place to place until the standard rate, prepared in 1874, was enforced in the western district the following year. The customary daily output, which at first was twenty boxes per shift of twelve hours, and afterwards twenty-five, had increased to thirty boxes per shift of eight hours; and long before the era of competition in the American market thirty-six boxes in the shorter working day was recognised by the union as the limit beyond which no workman was permitted to produce. The eight hours' shift, combined with the three-shift system in the mills, was fast becoming the general rule, probably as a result of the formation of the masters' association. The first workmen's union ("The Independent Association of Tinplate Makers"), which was created in 1871, was confined, as already indicated, to the western district, and practically all the works affected were within fifteen miles of Swansea. The eastern district was completely isolated and almost unknown to the average unionist of the west. Iron and tinplate workers were included, because the two industries—more especially in the west—were for most practical purposes one. The iron industry in the west was created by, and almost entirely dependent upon, the tinplate industry. In the

large iron works of the east rails and other products were also manufactured; and the tinplate factories were largely in the hands of iron producers, who, acting upon the principle of insurance, increased the variety of their manufactures.

Apparently many of the documents of the union are still in existence, but permission to examine them was refused. It is evident, however, that whatever its purpose may have been, the union was not, in practice, a permanent combination. An element of continuity was preserved by the fact that the first secretary continued to act in that capacity until the conditions were entirely changed by the substitution of steel for iron. But the union apparently died and was resurrected several times. Hence it is sufficiently representative of fact to say that until the formation of the wider association in 1887 temporary combinations were formed when need arose. After a series of small successes at individual factories during a boom in trade, the first union failed in an endeavour to raise general wages; and soon it practically ceased to exist. The tide of trade had turned, and when the demand for higher rates was made in 1874 depression had set in. Nevertheless the struggle cannot be said to have been quite barren of result for the workmen. For, although the employers were no less anxious than the men to secure a standard rate, it is unlikely that without the struggle of 1874 a masters' association—a necessary antecedent to any such agreement—would have been formed so soon as it was formed, and that so favourable an opportunity for establishing uniform conditions would have been provided. In the end, therefore, the events of 1874 facilitated and accelerated the process of standardisation.

That the union was merely a strike society¹—a form of combination unsuited to the industry—partly accounts for its collapse; and the subsequent history of the trade suggests that even if it had emerged successfully from its first real test, its strength would have been largely

¹ See p 183

reduced rather than increased. But the union was at no time strong in numbers. Nor did it really succeed in obtaining recognition from the masters' association. It is true that negotiations with this body were conducted by the union officials during the dispute; but the latter acted on those occasions as the delegates of the general body of workmen rather than as the officials of the union. For the main important resolutions were carried at general meetings of all workmen; and the real part played by the union was that of focussing the demands of the men and of organising the general meetings, at which, naturally, the officials were appointed delegates. Before the struggle ended the men grew so dissatisfied with the officials that they ceased to employ them as intermediaries, and conducted negotiations with their own employers by means of delegates appointed at "works meetings." After the establishment of the standard rate the officials of the union sought to revise the rates paid for certain classes of work, but again their efforts to secure recognition proved unavailing.

Although the union was occasionally active it played little part in the wages struggles during the depressions of the seventies and eighties. Nor, after 1875, did it show any vitality before its ultimate extinction was brought about by the introduction of steel. At the time when the Monmouthshire dispute occurred no form of organisation existed among the workmen. The struggles at individual works in Glamorgan were conducted by means of "works meetings" throughout the trade, and promises of assistance were received from districts organised for the purpose. The strike in Monmouthshire was started under similar conditions. Delegates from the affected area visited the west and addressed works and district conferences. Thus all promises of assistance were obtained at general meetings of one kind or another. But frequent meetings of the workmen of the three counties, constant interchange of ideas, and especially a general conference at Swansea (in January, 1887) of delegates from all parts, produced far-reaching consequences, and finally

resulted in the formation of a new and more comprehensive association.

The assistance promised to those affected by the strike varied from place to place,¹ but the actual sums received were disappointing. Moreover, although the western workmen passed resolutions calling for the abolition of concessions² which had now become common, and the enforcement of the custom limiting the "make" per shift, the output in the west during the strike proved to be as great as the total previous output for the whole industry. Consequently the workmen of the west were not in any way responsible for the failure of the Monmouthshire employers in their effort to reduce wages. The latter was due entirely to a revival of trade.

The functions and government of the new association may be briefly stated. Created in 1887 and registered early in the next year, it was entitled the "South Wales, Monmouthshire and Gloucestershire Tinplate Workers' Union." As already indicated, it differed from its predecessor in that its membership was limited to those engaged in tinplate factories; iron and steel workers were excluded. On the other hand, while the old union was confined to the western district, the new one extended as far east as Gloucestershire, *i.e.*, it embraced practically the whole area³ of tinplate manufacture.

The form of government was determined largely by geographic factors. The tinplate industry at this time was highly localised; delegates could attend general meetings with relatively little expenditure in train fares and without much loss of time. Consequently, the "supreme authority" was the General Council, to which the central executive was directly responsible.

Lodges or "local branches" were formed at all the factories where members of the union were employed.

¹ In the Llanelli district 2s per week per man; in Morriston 5 per cent. of wages, in Pontardulais 7½ per cent.

² Concessions generally took the form of increasing the standard number of sheets per box (payment being per box) or producing a certain number of boxes per month without payment.

³ Except Mold (North Wales) and Staffordshire

Purely local questions, such as the victimisation of members, were first dealt with at the lodge meetings; but probably the main function of the local branches was administrative. The local officials—who received no remuneration—were mainly responsible for collecting contributions and levies and paying strike benefit.

The tinplate producing area is divided into a number of well-defined districts, most of which contain compact groups of factories. A number of local branches in close proximity were united for the purpose of forming a "district branch," controlled by a committee; e.g., the lodges in the Swansea Valley were controlled by the "Swansea Valley Branch." The main functions of the district organisation were to facilitate the process of creating the central authority; to elect a delegate upon the central executive; to foster the spirit of unionism in the district, and to take part in parish, town and county politics. The district government received no contributions from, and paid no benefits to members; but the local branches were required to contribute sufficient to defray all expenses of administration.¹ The constitution of the district council seems to have varied slightly from place to place. Delegates were appointed by the local branches, but whereas in Swansea Valley the number was determined by the membership of the lodge,² in the Avon district two delegates were allowed for each department (mills and tinhause).³ In addition to the statutory council,

¹ It is not clear whether such contributions were taken from the monies contributed by individual members to the general fund, i.e., whether the expenses of the district council formed part of the general cost of administration. This is a point of some importance, since the salaries of the district officials were determined and advanced by the district meeting.

² The number of delegates from each lodge was as follows —

20 members, and not exceeding 150	1 delegate.
150 " " " 300	2 delegates
300 " " " 450	3 delegates
450 " " " 600	4 delegates

³ Since there were ten factories represented in this branch the council numbered forty exclusive of the president, vice-president, treasurer, and secretary. The secretary, and in some cases the other officials, enjoyed some financial remuneration for their work, which was performed in spare time.

general meetings were held periodically. In some cases the group was so compact that the meetings were always held in the same place; but in the widely scattered districts lodges were visited in rotation.

The Central Executive consisted of the officials of the society, together with "from three to eight other members . . . nominated by the works or branches,¹ and elected at the Annual Council." Meetings of the Executive were called by the General Secretary, who was thus able to exercise considerable authority. Since the members of the executive were only called together "to consider urgent cases and to transact such other business as the council may direct," the secretary might have exercised sole control during the interval between two council meetings. The only check lay in the power enjoyed by all members of voicing their opinions in the weekly journal ("The Industrial World") published by the association. In practice the President and Secretary of the society, together with the editor of the journal, seem to have formed an informal sub-committee of the executive. So frequently did "urgent cases" appear during the long-continued depression, that the observance of the rules would have involved considerable expense. Consequently the council meetings were often of a stormy character. Delegates sometimes went to them (fresh from lodge meetings at which votes of censure upon the general executive had been passed) with the fixed intention of demanding the resignation of the secretary; but the eloquence of the latter (combined with the minor fact that he often adduced good reasons for his actions!) usually resulted in the passing of votes of confidence in the officials and in refusal to accept their offers of resignation.

Although the members of the Executive were nominated by the district branches they were elected by the General

¹ Undoubtedly the district council is here referred to; for one of the objects of the Avon district branch was "to elect a member to represent the district on the Executive Council of the Central Association." Nominally there were seven district branches, and these were supposed to include all the local branches in existence. But some of the rules of the association were more generally broken than observed.

Council. This body, the supreme authority, consisted of the executive committee together with "one delegate from each works with twenty members or more elected at a meeting of the works or branch which also determines how long he shall serve. A delegate has from one to four votes according as he represents from 150 to 600 members."¹ Meetings of the General Council were held half-yearly.

The union was one of the class known as "wage-protecting associations" or "strike societies," i.e., it performed none of the functions associated with friendly societies. Benefits were paid to "victimised" members and to those thrown out of employment in consequence of wages disputes.² Victimised members appealed to the local branch; and if the local officials failed to secure the reinstatement of the "victim" the central executive took up the case. But under no circumstances was the local branch permitted to declare a strike without the approval of the central body. All questions relating to general conditions of labour were dealt with by the General Council or its executive.

The energies of the new association were mainly directed to—

- (a) Re-establishing and afterwards maintaining the standard rate fixed in 1874.
- (b) Restricting the output to thirty-six boxes per shift of eight hours.

¹ It will thus be seen that the constitution of the Swansea Valley District branch was similar in this respect to that of the union as a whole.

² The disputes benefit provided in the rules was 12s per week and 1s for each child; victimisation benefit was fixed at 15s. per week and 1s. for each child. Boys were to be paid 6s per week in the former case and 7s. 6d. in the latter. The original contributions amounted to 6d per week for men and 3d. for boys. One rule states that "The funds may not be drawn upon until they have reached the sum of £20,000, or afterwards if reduced below £10,000"; but this rule, like many others, was frequently broken. During the depression of the nineties, when funds had been exhausted, the contributions, which were periodically fixed at meetings of the General Council, varied according to needs. But the total income often varied inversely with the rate of contribution!

Early in its history the attitude adopted towards new machinery was one of uncompromising hostility, but subsequently the men accepted the inevitable. During the last few years of its existence, when blackplates were required in large quantities for export, strong opposition was presented to the manufacture of such goods; for the operatives of the tinhouse suffered considerably. But this policy, too, proved unavailing. Since none of the new methods of manufacture affected the mills, it will be seen that the last two causes of disputes—new machinery and the export of blackplates—related mainly to the tinhouse, so that throughout the period of existence of this union the workmen in the finishing department had grievances which did not affect the millmen—in regard to the export of blackplate, indeed, the interests of the two branches were for a time in direct conflict. This fundamental difference upon important questions constituted one of the main factors contributing to the weakness of the union, and ultimately proved to be one of the chief causes of the dissolution. Furthermore, the divergence of interests of the two sections has materially affected the history of labour associations since the reorganisation of the trade in 1899.

During the first four years of its existence the task of the union presented no great difficulty. Born on the eve of a general revival of trade, favoured in its youth by a period of great prosperity, culminating in the remarkable boom created by the McKinley Act, the union succeeded, after very little fighting, in making the standard rate operative. But, in spite of a series of efforts to enforce it, the regulation limiting output was often disregarded.

The early efforts of the union were mainly concentrated upon the Swansea Valley district, in which its strength chiefly lay and where the opposition was strongest. The first dispute in that district was due partly to the refusal of the employers to pay the 1874 list and to observe the customs of the trade—embodied in the union regulations—in matters relating to promotion and the length of

working day; and partly to the alleged dismissal of non-unionists. Since the struggle ended in a victory for the workmen on the main points in dispute, the status of the union was raised and its strength increased; and the standard rate was enforced elsewhere without much difficulty. Another dispute in the same district and in the same year (1889) is chiefly interesting for the method employed in its settlement. A joint committee of the executives of the union and masters' association upheld the claims of the workmen. Probably this was the first occasion in the history of the trade upon which a joint committee of the two associations had been called; and it implied—also for the first time—the official “recognition” of the union by the complementary society. The method of conciliation had been employed previously; but in all cases the individual employer had conducted negotiations, on his own behalf, either with the union or with a committee of his own workmen.

The new machinery to which the union objected consisted of a “patent tinning-pot,” which involved not only the use of a disagreeable fluid known as “flux,” but also the displacement of the washman and the simplification of the work of the tinman. Although they emphasised other aspects, such as the personal danger incurred in working with the “poisonous material,” the hostility of the workmen was at first probably due to a deep-rooted objection to all labour-saving devices. During the prosperous years preceding the McKinley Act their opposition proved successful; but during the subsequent depression they were probably educated to the view that improvements in methods of manufacture reacted favourably upon the main body of workmen engaged in the industry, and generally upon the community as a whole. But whether this be true or not, they could not withstand the tendencies of the time, aided as these were by the necessity for reducing cost.

Nevertheless, even as late as 1895 the new machine caused considerable dissatisfaction, mainly on account of its imperfection and the loss in wages involved to the

operator; for the cost of experiments seems to have fallen partly on the workmen.¹ Accordingly the union demanded the payment of a minimum daily wage (equivalent to a piece wage for thirty boxes) to tinmen employed on the patent pot. This demand was not conceded, but before the depression ended the experimental stage was past and the trouble at an end.

The struggle of the union against the exportation of blackplate was equally futile. An attempt was first made to limit the production of blackplate for export purposes to one-third the total output of the mill affected; but, late in 1892, the union endeavoured—without success—to prevent all exportation of the semi-manufactured article. The sole purpose at this time was to prevent the erection of “dipperies” in America. But in 1895, and at intervals subsequently, when the trade in blackplate had extended to other foreign countries and practically ceased with America, attempts were made to force employers to complete the manufacture of tinplate in their own factories. The one object in the second case was to secure employment for tinhousemen: their interests alone were involved. But in the first case, since the erection of dipperies was merely the first step in the creation of a self-supporting American industry, the prosperity of all classes of workmen was endangered.

The chief dispute which occurred during the period of

¹ “The Industrial World” of October 11, 1895, states. “The problem employers have ever since set themselves is to reduce the number of men at a set. They have long taken the tinman’s boy away, but it required no invention to do that, the tinman was simply compelled to do the boy’s work, but to do away with the washman meant a saving of 3d. per box, and Mr Daniel Edwards, of the Duffryn Works, Morriston, was one of the first to conquer the difficulty with his patent machine. Then arrived a time when almost every employer tried in his own way to bring about a tinning operation that would save the payment of royalties to a competitor. The result has been a large amount of experimenting, largely at the expense of the workmen.

It is dishonest to expect a man paid by task rated at 3d. per box at a Morewood pot to spend days trying to get work out of another untried, and possibly unworkable, pot, and allow no pay except on the boxes produced. Yet that has been done in almost every tinhouse in the trade, and a protest from the tinhousemen is loudly proclaimed to be opposition to progress.”

depression related to the violation of the rule regulating output and to the reduction of wages. Although a relatively strong masters' association existed, and nominally controlled the conditions of employment, local variations in wages and output were frequent during the depression. Strange as it may seem the observance of the custom restricting output¹ was for some years regarded by the workmen's union as more important than the payment of the standard rate; and all the serious disputes from 1892-1894 occurred over the former. The workmen probably believed an output of thirty-six boxes to be a "fair day's work"; and when the custom was disregarded the cry of "bearable existence" was raised. Restriction was said to be necessary for the protection of the weaker men, who would otherwise be compelled to produce the same quantity as their stronger brethren. An average output of thirty-six boxes naturally presupposed an occasional excess to counterbalance deficiencies caused by breakages, etc.; but a regular production of forty boxes was regarded as a physical impossibility.² Yet, in spite of the importance nominally attached to the prevention of "driving," two other considerations undoubtedly weighed more heavily at this time with the men.

In the first place, when, under normal conditions of trade and limited output, the producing capacity approximated closely to the demand, they believed the enforcement of the rule to be necessary to secure work for all. They adopted almost a static rather than a dynamic view. They emphasised the momentary effects of a change

¹ Which was not officially recognised by the employers

² "The Industrial World," March 16, 1894 "It will be observed that an average make of thirty-six boxes presupposes an occasional excess of that number, and the now well-known thirty-six box rule provides for that, inasmuch as it allows work to be drawn back to the extent of four boxes per shift. In this way almost every millman, to secure an average of thirty-six boxes, must occasionally make forty boxes. It will now be observed that tinplate employers, having got the thirty-six boxes from being a maximum to be an average, now again claim to have an average of forty, and by inference it can be argued that if they got forty boxes they would soon be claiming forty-five boxes per shift of eight hours "

from restricted output to unregulated production, or an improvement in the method of production through the employment of heavier and better machinery in the mills. And these would naturally be unfavourable to a small percentage of the workers. But they ignored the fact that the number of mills in existence at any moment was partly determined by the limited capacity of each; and that when the period of readjustment was over changes in methods would be introduced but slowly. This is not the "lump of labour" fallacy; there is no evidence that the men believed the amount of work in existence to be fixed and pre-determined, so that any increase in the production of one group would permanently reduce the amount of work available for another. The policy of restriction was due at this time to the fear of the consequence of change. In the early days twenty-five and thirty boxes in a longer working day were genuinely regarded as the limit of physical capacity; accordingly, the custom of restricting output was established; and when the mills were vastly improved the men feared the results which might accompany its abolition.

In the second place, during the depression of the early nineties—and to a large extent before the boom—it was held that the removal of restriction would indirectly affect wages rates. The demand at the time was abnormally low and extremely inelastic; nevertheless, production per mill would be increased. Prices would therefore fall still lower, the depression would be intensified, and more men would be thrown out of employment. And an increase in the number of idle factories and the proportion of unemployed workmen would add to the difficulty of enforcing the standard rate. So great was this fear that on one occasion the union not only fought strenuously against violations of the "make" rule in some places, while permitting variations in the wages rate in others, but made an effort to reduce the output at all the works to thirty-two boxes per mill. This policy, which was opposed by the employers as strongly as it was advocated by the workmen, is now regarded as the

wisest for most industries suffering from temporary loss of trade.¹

During the last few years of its existence—from 1895 onwards—the union devoted all its energies to another aspect of the wages problem. During the previous sectional struggles involved in the enforcement of the custom relating to output the majority of the employers succeeded in reducing the wages paid for all classes of work, and by 1895 few, if any, paid the 1874 list. Reductions varied from 5 to 25 per cent. of the standard rate. They took the form in some places of deductions from weekly wages; in others of concessions in boxes, *i.e.*, of payment for a smaller number of boxes than were actually produced. In the remaining factories the men suffered from both money reductions and concessions. Attempts to re-establish the 1874 list by means of strikes at individual works selected for the purpose proved unavailing. Consequently, in 1895, a “general strike” was declared, and in spite of adverse circumstances the union achieved its object. But its triumph was of short duration; for in a few weeks reductions once more became the rule rather than the exception. The following year a similar strike produced the same result—the temporary enforcement of the “list,” followed by reductions. By that time the union had exhausted its strength, and until trade revived at the end of 1898 wages at all the factories were considerably below the standard rate. Even during the short periods for which the “list” was enforced, violations of the custom regulating output frequently occurred. At no time after 1891 did the union prove sufficiently strong to compel the observance of the two customs together.

¹ The reasons for the opposition of the employers have already been indicated in the discussion of proposals to reduce output by means of “stop weeks.” It will be observed that the above is not a defence of the general policy of restriction of output. The argument of the last paragraph merely justifies the policy of enforcing during trade depression a custom which had been observed with much greater faithfulness during normal periods, while the previous argument is a defence of retaining the *status quo*. Restriction as a general policy will be considered later.

During these wages disputes much was said and written about a "living wage," but the piece workers engaged in the industry were so well paid that a reduction of 10 per cent. need not have caused great hardship; and, in view of the general level of wages in the country at the time and the exceptionally unfavourable conditions of this trade, the workmen could scarcely expect to enlist the sympathy of the public by resting their case upon such grounds. Strictly speaking, they were much more anxious to secure uniformity than to establish the 1874 list. The latter was obviously the most serviceable instrument for the purpose. Without uniformity it seemed as though wages would pursue a downward course, and might ultimately reach a level 50 per cent.¹ below the standard rate; they would certainly gravitate towards the lowest rate actually paid. That the workmen desired uniformity more keenly than the 1874 list is amply proved by their repeated efforts at compromise upon a reduction of 10 per cent. and by the articles published during these years in "The Industrial World."²

Nor was a strong defence of their attitude lacking. They argued that the interests of their employers depended more upon uniformity of wages conditions than upon a low piece rate. Although a fall of 10 per cent. in wages would be accompanied by a corresponding reduction in labour cost, the saving in total cost would be less than 3 per cent. And so small a reduction as would result in price could exert no influence upon sales; for between

¹ Reductions of 35 per cent. and 40 per cent. were actually made in isolated cases.

² January 10, 1896. "The workers . . . are ready to meet and join employers to do anything in reason, if it can be proved to be for the general good, on one condition, that whatever wages be they shall be uniform."

January 17th "The highest possible concessions would be 12½ per cent., or say, 3d. per box. Now, 3d. per box divided on 112 sheets to the consumer is so infinitesimal that it could have no bearing whatever in increasing the demand for tinplates. Therefore, upon this ground, reductions of wages benefit no one except possibly the merchant."

January 31st. "If makers can show that competition can be met and improved trade secured by readjustment of wages, their workmen will fairly meet them, on the one condition that they join in maintaining uniformity of wages."

relatively wide price limits the demand was extremely inelastic. The American market would not be affected in the slightest degree. The employers failed to distinguish keen internal competition—often resulting in the loss of a market by one manufacturer through the under-selling of his rival—from changes in the total demand due to foreign competition. Moreover, the merchants, rather than the manufacturers or consumers, would in most cases be likely to benefit from a fall in wages. These were, in effect, the arguments employed by the workmen in defence of their action.¹

¹ It may appear that a wise policy of moderate differentiation would have enabled the workmen employed in the best-situated or well-equipped factories to enjoy the standard rate, while permitting the payment of lower wages in those works which suffered through geographic or other disabilities. On the assumption that wages are determined by "standard of life," and that a common standard is adopted throughout a given trade, local variations, determined by differences in the cost of living, are permitted by trade unions, as, for example, in the building trades and in the steel industry. But it should not be forgotten that in these cases such variations do not operate unfavourably upon the employers. For in the building trades competition is purely local in character; and a contractor engaged upon an undertaking in an "outside" district is compelled to pay the rates prevailing in that district. Again, while the rates for steel workers vary between South Wales and Yorkshire, there is little or no competition between the two groups of manufacturers. In most cases they produce different classes of goods.

Variations in minimum wages rates are also permitted under the Coal Mines' Act, and will probably exist in agriculture if wages boards are established for that industry by Act of Parliament. These industries present some analogies with the tinplate industry. But they are controlled by law, and the danger that the employer will utilise the lower rates as a lever for reducing general wages is non-existent. Moreover, those industries are not so strongly localised as the one under consideration, nor are the separate undertakings so similar to each other as in this case. An unvarying rate for each class of work was essential, and is still essential, to successful collective bargaining, for the general conditions of manufacture are similar in all the works, the product is "portable," and competition is keen in the world market. Whether they be regarded as necessary to provide, on the one hand, a "living wage," or, on the other, an exceptionally high wage made possible by the conditions of the industry, when wages rates are determined by voluntary agreements in a strongly localised industry, a uniform rate applying to all the undertakings seems to be absolutely essential. Differential rates are only possible when—

(a) The industry is widely distributed and little or no inter-local competition exists

(b) The minimum wage is fixed by legal enactment

Little remains to be written upon the general control of the union, the character of the administration and the methods of government. The union was never rich. Being simply a wage-protecting association it failed to keep the members together. When trouble threatened workmen flocked like sheep into the fold, and for a period paid their contributions regularly. But when the dispute had been settled—adversely or in their favour—they left the union, which, weakened in numbers and impoverished financially, was unable to enforce the settlement upon the individual employers. A binding force such as is provided by the payment of friendly benefits was needed, which would operate in times of peace and prosperity. But although it was merely a strike society the union did occasionally relax the rule relating to the payment of benefit, and make grants to members who were out of employment through slackness of trade. For it was argued that during general depression this was necessary¹ to the maintenance of the standard rate. Payments of this character created considerable dissatisfaction among the members of the society.

Again, the rates of contributions were frequently revised by the General Council.² At one time normal contributions and strike levies were kept apart; at others they were merged into a single payment. During the depression the income of the society diminished, while the demands upon the funds naturally increased. Although a rule existed to the effect that no benefits were to be paid until the funds reach £20,000, or afterwards when they fell below £10,000 it was never observed. After the struggle of 1896 the union grew so poor that ultimately the officials

¹ Though quite unnecessary when a workman was thrown out of employment in brisk times by some accident other than a wages dispute

² It may be mentioned in passing that the absence of a constitutional rule relating to the methods by which other rules could be altered, or at least the ease with which the latter could be changed, and the frequency of such changes, proved to be a great source of weakness. A simple vote of one meeting, called, it may be, for the discussion of other questions, seems to have been sufficient for all changes introduced

were compelled to borrow £1,000 to provide benefits to workmen employed at certain factories where strikes had been declared against reductions in wages.¹ Undoubtedly the funds of the union were unwisely spent on more than one occasion, so that the frequent complaints of some of the men were not without foundation. The most troublesome group of members were those employed in the extreme west. More than once they left in a body, only to rejoin when reductions were proposed at their own works. The most loyal group were those employed in the Briton Ferry district, but even they grew dissatisfied at last and seceded from the union.

In the next place, the officials of the society did not enjoy the confidence of the employers. It seems fairly evident that some of the latter were more generously treated than others. Occasionally a manufacturer agreed to pay his workmen (say) 10 per cent. below the standard rate for a specified period, and made contracts with customers for that period at prices based upon the rate agreed upon; only to find that in a short time the men demanded a return to the standard rate. And having agreed to supply plates the employer was forced to concede the demand and complete the contract at a loss. Again, an employer who congratulated himself upon having stolen a march upon his rivals by obtaining a reduction of 10 per cent. in wages often discovered that, in spite of the promises of the officials, the union had afterwards granted 15 per cent. to his neighbour! During the last years of its life the union and its officials were completely ignored by most of the employers.

¹ The following statistics of the union may be interesting to some readers —

Year	Receipts £	Management Expenses £	Per cent
July, 1891—March, 1891	13,571	1,198	8·74
Nine Months, 1891	3,638	604	16·6
1892	8,821	1,046	11·85
1893	9,282	1,158	12·48
1894	6,530	1,041	15·91
1895	4,622	1,226	26·52
1896	2,187	1,034	47·27
1897	12,000	1,200	10·00

The failure to maintain the standard rate which had been regained in 1896, combined with the poverty of the union and the general feeling of dissatisfaction with the officials, made it fairly evident that the days of the society were numbered, and as early as 1897 some tinplate workmen sought admittance into unions connected with other trades.

In the meantime the masters' association, which had been formed in 1889, had been dissolved. While it exerted real influence over the actions of its members, and conducted negotiations with the union, it proved a source of strength to the latter. And, on the other hand, while the union remained strong enough to enforce agreements, little inducement existed to the masters to remain outside the association. The two societies were interdependent. When, in the early days of the depression, the workmen became indifferent and deserted the union, the latter was weakened and its ability to enforce agreements diminished. This reacted upon the association by providing a real inducement to the employers to withdraw and make more favourable terms independently with their men, whose position had been weakened by secession from the union. This in turn reacted unfavourably upon the union. And so it went on. Both grew steadily weaker, and in February, 1896, the masters' association was dissolved.

A few months after the re-establishment of the standard rate at the end of 1896 several attempts were made almost simultaneously to reduce wages; and in Monmouthshire, Swansea District, and Llanelly the men were faced with the impossible task of defending the position they had won. At the October council meeting of the union an attempt was made at compromise by accepting a general reduction of 15 per cent. But the representatives of the Briton Ferry district—the stronghold of the union—fought strenuously against the proposal. Ultimately the district branch resolved to sever its connection with the society and to organise a new and better union for the whole trade. Meanwhile dissension grew sharper among

the two sections—millmen and tinhousermen—and the general feeling of dissatisfaction with the union increased. On October 14, 1898, the last number of "The Industrial World" was published, and with this the remarkable career of the union may be said to have terminated.¹ During the last years of its existence the union was ignored by the employers, while the contributions of the members were scarcely sufficient to pay the expenses of administration.²

To sum up, the two main causes of failure were, (1) the unsuitability of a "strike society" in an industry of this character; (2) the divergence of interests of millmen and tinhousermen. The discipline provided by the payment of friendly benefits was lacking; consequently the union suffered from great fluctuations in the membership. Workmen joined, deserted, and re-joined when and how they pleased. A strong association could not be expected under such conditions. Again, tinhousermen were for many years—if they have not been permanently—injured by the competition of the American industry. But compensation to the millmen appeared in the rapid growth of the trade in blackplate and sheet steel. Many of the disputes, too, related to machinery and the export of blackplate, in which the millmen were only slightly interested. The latter complained of the frequency of such disputes, while they were blamed by the tinhousermen for their lack of spirit and the irregularity and smallness of their contributions. The enervating effect of long-continued depression of trade, the lack of confidence in the union on the part of employers and workmen (resulting from variations in the concessions granted and unwise administration of the society and its funds) may be regarded as contributory causes of the failure. At the end of 1898 neither masters nor workmen seemed capable

¹ In this number appeared a notice summoning a meeting of delegates. But "to call this a union council would be to give it a wrong description, for it is no secret that practically the union is non-existent."

² From January to June, 1898, they only amounted to £75 per month, and afterwards they fell to £30.

of concerted action. The trade was in a very depressed state; wages varied from place to place, but were everywhere considerably below the standard rate. Yet within a year a complete change took place. Trade recovered, a masters' association was formed, the workmen joined or formed unions, and a strong conciliation board was established.

CHAPTER IX

ORGANISATION OF LABOUR (*Continued*)

THE NEW UNIONS AND THE CONCILIATION BOARD

THE lines of development of labour organisation and collective bargaining since 1899 have been largely influenced, if not entirely determined by the actions of groups of workmen during the short period in which the old union was quiescent. In December, 1898, before the formal dissolution had taken place, a dispute occurred at Llanelli, where three employers jointly demanded a reduction in the wages rate. At first the union was completely ignored by masters and men; but ultimately, in consequence of the difficulty of conducting negotiations through "gramaphone" delegates, the secretary of the despised union was called in by the workmen.¹ In the meantime, however, a number of the latter had become members of the Dockers' and Gasworkers' societies, whose officials claimed the right of taking part in the negotiations. And this added to the difficulty of the situation. A few weeks later a large number of tinhouse-men employed in the Swansea Valley also joined the Dockers' Union. Some of these had previously been refused admission to the British Steel Smelters' Association. For four years the latter society had consistently refused applications from all classes of piece-workers employed in tinplate manufacture. Its officials were desirous of effecting an amalgamation or federation of the two societies and had made definite proposals to this end.² But while the tinplate union existed they carefully

¹ And given "plenary power to settle the dispute at a reduction not higher than that agreed to at the meeting"

² In April, 1898.

avoided the suspicion of "poaching."¹ In January a conference of delegates was convened by the officials of the moribund union at which a proposal to form separate unions for the two main departments was carried by a large majority. The union was then formally dissolved.² A week later a conference of millmen was held, at which 164 mills were represented, and a resolution was carried in favour of an independent union for millmen. A committee was at once formed, and the new society was entitled "The Tin and Sheet Millmen's Association." The dissolution of the old wage-protecting association left the Steel Smelters' Society free to admit tinplate workmen into its fold; and the enrolment of millmen immediately began. These, it will be shown, formed a self-governing branch, controlled by its own district council and executive. Thus the millmen were divided among themselves. The members of the independent society argued that to become the numerically weaker

¹ Moreover, it was believed that by admitting discontented members of the old society they would considerably increase the proportion of those likely to prove unruly, and discipline might suffer. The strength of a union does not lie altogether in numbers. A considerable factor contributing to the strength of the relatively small Tin and Sheet Millmen's Association is the homogeneity and character of the members.

² The voting was as follows.—

	For two unions	For one union
Mill and Tinhause Branches	508	237
Mill	1,246	186
Tinhause	276	142
	<hr/>	<hr/>
	2,030	565

It will be seen that only a small percentage voted. Many had already joined the Dockers' Union after votes had been taken at individual works, a small number had thrown in their lot with the Gasworkers and General Labourers' Union; the remainder constituted the "passive majority." The complete or partial separation of the two sections of tinplate workmen was foreshadowed by the formation of separate local branches for tinhausemen and millmen in those cases in which the size of the factory made two branches desirable. In the case of branches containing both sections the divergence of interests was clearly evident at lodge meetings. In the United States at this time the groups belonged to different unions. The tinhausemen were combined to form the International Protective Association of Tinhausemen and Mill Operatives, the millmen formed a branch of the Amalgamated Association of Iron and Steel Workers.

department of a strong union might prove a ruinous policy. If complete autonomy were refused they might be out-voted upon questions affecting themselves only.¹ If, on the other hand, the separate branches were allowed complete control of their own affairs, while financial control and responsibility remained in the hands of the central government, a strong incentive to reckless and extravagant policies and methods would be created. And if appropriate financial control were added to the powers of the branch the latter would be to all intents and purposes a separate and independent association.

Some of those who joined the Steel Smelters' Association did so because the other society, whose strength lay in the Briton Ferry district, was the natural successor of the old union, and was controlled by some of the officials of the latter, in which they had completely lost faith. The child suffered for the sins of the parent. Others joined the larger society because they believed in the control of the two stages of manufacture by one society, especially in view of the fact that in some places the steel and tinplate works were owned by the same employers. In such cases "blackleg" labour in tinplate mills could be prevented by the opposition not only of millmen but also of their fellow-members in the adjoining steel factory. It will be shown that other considerations appeared later, when dumped tinplate bars were imported into South Wales.

Thus, early in 1899, four societies existed for "direct labour" in the industry. The above two societies included millmen only; and the "Dock, Wharf, Riverside, and General Workers' Union" gathered in the vast majority of the workers in the other departments, while the "National Union of Gasworkers and General Labourers" captured the remaining few.

¹ The steel workers might, for example, prevent a strike of tinplate millmen for higher wages. For such a strike would react upon them by (a) draining the union funds or necessitating a pecuniary contribution towards strike benefit; (b) reducing the demand for steel and pig-iron. The representatives of the steel workers on the National Executive could always out-vote the members representing the tinplate workers.

While the workers were being re-organised the tinplate trade rapidly improved. New markets had been sought and discovered; the demand from all consuming countries, except the United States, increased. The unions therefore demanded the re-establishment of the standard rate of 1874. In April a new employers' association was formed.¹ All the manufacturers wished for peace, and most of them, like the workmen, desired uniform wages rates. Moreover, the new societies were better organised and controlled than their predecessors; together, they had enrolled the vast majority (about 85 per cent.) of the workmen, while most of the officials enjoyed the confidence of the employers. The time was ripe for the formation of a Conciliation Board. Accordingly, in June, a joint conference was held, and the 1874 list was once more adopted as the standard rate. As a result of this conference a Conciliation Board was established for the control of "direct labour," *i.e.*, those engaged in the mills and tinhause.²

Although the external conditions under which the first joint conference was held were extremely favourable to the workmen, and the standard rate was granted with little reluctance,³ the officials of the unions encountered difficulties at the very start; and some years passed before these were overcome. The workmen's representatives met the employers at the conference, and afterwards at meetings of the Conciliation Board, without previous consulta-

¹ It is claimed that the credit for the new association belongs to Mr. Ben Tillett, who, early in the year, called a meeting of employers for the consideration of a scheme, based upon the Birmingham Alliance, providing for dual control of the industry. But the foundation for such a claim is very slight. For in June of the previous year a meeting of employers had been held and a new wages list proposed. The employers rejected the "Alliance" scheme, and adopted the alternative of an association on orthodox lines. But even if such a meeting had not been called the association, rendered necessary by the reorganisation of the workmen and the necessity for industrial peace during a period of prosperity, would have been formed.

² "Indirect labour," *i.e.*, artisans, such as engine-drivers, firemen, etc., were excluded at first.

³ It became operative on October 1st, and a uniform rate, involving a reduction of 10 per cent. off the "1874 list," prevailed during the interval.

tion among themselves.¹ They did not present a united front. In the first place, the unions did not support each other's claims. When, in 1901, the Steel Smelters' Society submitted a claim for an increase of 5 per cent. in wages, the rival association remained apparently indifferent to the result, but emphasised the necessity for preserving the custom of limiting output, which custom (they afterwards stated) might be endangered by an increase in wages. Again, when the Steel Smelters resolved—after the meeting of the Conciliation Board—to press their claim for an increase in the rate, the Dockers' Union promised to co-operate; but when the former handed in strike notices the latter failed to respond. In the second place, the unions employed different methods of procedure. The demand of the Tin and Sheet Millmen's Association for the standard rate in 1899 was accompanied by the customary month's notice terminating contracts; but the rival association decided to await the results of the conference before taking further steps. Furthermore, serious misunderstandings arose between these competing unions through the action of a few members who, having fallen in arrears in one society, sought to evade payment by joining the rival organisation. The Gasworkers' and Dockers' Unions were also accused of poaching upon the preserves of the other societies. So much was their action of enrolling millmen resented that the Steel Smelters threatened to retaliate by admitting workmen employed in the finishing department.

But the most serious difficulty consisted of the strained relations of the officials of the rival organisations of millmen. It was admitted on both sides that one society alone was desirable for this class of workmen;² and, on the

¹ Although meetings of the millmen's associations were held in the same town on the same day, to discuss the same questions (the proposals to be submitted to the joint conference), no communication passed between them.

² "Your executive are of opinion that it would be to the best interests of tinplaters to be united in one organisation . . . but that organisation should be composed of tinplaters only" President's address at the General Council of the Tin and Sheet Millmen's Association, December, 1901. The following resolution was adopted

suggestion of the secretary of the Steel Smelters' Society, a meeting of representatives of the competing associations was held in October, 1901. It seemed an opportune moment for amalgamation, for the rules of the larger society were being revised to suit the new conditions created by the "Taff Vale Judgment." But, notwithstanding the general desire for one society, the conference ended in complete failure. And the cause of failure now seems trivial in the light of the issues involved. When the old strike society was dissolved a considerable debt remained, which was ultimately met by the Tin and Sheet Millmen's Association. But at this time the question of meeting the debt was still open. Since a large number of the old society had joined the Smelters' Union, the latter, it was argued, should share the burden while the societies were still separate. This they refused to do; but they indicated their willingness to guarantee full repayment of the debt after the formation of the amalgamated society. The conference terminated without any prospect of agreement upon a question which seemed to them at the time fundamental.¹

The officials of the independent society of millmen expressed the view that separate and independent

by the National Executive of the Steel Smelters' Society in September "That, believing it to be to the best interests of the trade that the various societies connected with the iron and steel trades should be either federated or amalgamated (the latter for preference), they are prepared to enter into communication with the executive of any other union connected with the industry with a view to the course stated."

¹ "We pointed out that our Society, as a society, had no legal or moral or other responsibility for these old debts" Monthly Report, Steel Smelters' Association, October. "The one element necessary for the fusion of both societies was a little display of a conciliatory spirit. . . A successful amalgamation depends upon a goodwill and mutual confidence, and this cannot be secured whilst one section of the millmen, even in appearance, have to join another section, who claim to be the wealthiest and strongest, and then have to be dependent, more or less, for the removal of obligations upon that section" Monthly Report of the Tin and Sheet Millmen's Association, October, 1901. It is with reluctance that one refers to the bitter feelings which existed at this time, especially in view of the harmony prevailing among the present officials of the various unions, but the personal element entered so largely, and influenced subsequent events so profoundly, that it is impossible to avoid doing so

societies should exist for the steel and tinplate industries. Foreign tinplate bars were imported during this year into South Wales and employed in the manufacture of tinplate. While such importations apparently benefited the tinplate industry (and therefore the workmen engaged in it), they created unemployment among the steel workers. Thus the interests of the two sections were as widely divergent as those of the millmen and tinhousermen had been some years previously. And the opponents of amalgamation expressed the fear that tinplate makers might be compelled to assist the steel workers by refusing to work with imported bar. But there was obviously no ground for such fear, for the tinplate millmen formed an autonomous branch of the society and could not be coerced.

Undoubtedly the main—perhaps the sole—cause of failure is to be found in the personal factor, combined with the enormous influence exercised by the officials over the councils of the two societies. The associations have retained their independence up to the present, but while, ten years ago, the line of least resistance was amalgamation, to-day, in consequence of the machinery created by administrative necessity and the ease with which concerted action is taken, there seems every possibility of continued separation for an indefinite period. The repeated refusals of the Tin and Sheet Millmen's Society to amalgamate with the Steel Smelters, in spite of their expressed desire for a society embracing all the mill workers in the trade, and their willingness to assist in the formation of an independent society of this character, suggest a wide divergence of opinion upon one of the most fundamental problems of labour organisation. The attitude of the members of the independent association implies a belief in organisation according to occupation or craft. But the official attitude of the Steel Smelters implies the belief that the advantages of "vertical integration" are not confined to capital; or, at least, that such a process in relation to factory organisation and financial control necessitates a corresponding process in labour organisa-

tion. The former were acting consistently with their belief when they refused (in 1904) simultaneous proposals for amalgamation from the Dockers' and Steel Smelters' Societies. The latter, however, were guilty of apparent inconsistency in refusing to admit tinhousemen. But their policy was the most obvious one under the circumstances.

For two years the Conciliation Board was conducted in a somewhat haphazard manner. The workmen appeared at meetings without previous consultation, in spite of prolonged discussions upon important and difficult questions relating to the methods of remuneration for certain classes of work; and often the groups of representatives seemed to be at cross purposes. The need for concerted action, always evident, grew more pressing as time went on, and in June, 1901, a conference of delegates of the four labour unions was called for the discussion of questions of common interest. Further conferences were held, and these ultimately resulted in the formation of the "The Tinplate and Sheet Mill Workers' Wages and Disputes Board." This should not be confused with the Conciliation Board. The latter is a joint board of employers and workmen and has been in existence for fifteen years; but the wages and disputes committee was of the nature of a joint executive of the four associations of workmen, and was dissolved in November, 1904.

The disputes board performed many useful functions. Meetings were held to discuss the claims presented by the affiliated societies, and those adopted were submitted as the claims of the composite body. In this way an unbroken front was shown to the employers; and the demands made by one society were supported at the joint meeting by the representatives of the other societies.

The committee proved useful in enforcing agreements made at the Conciliation Board upon non-associated employers, and upon all others who proved recalcitrant¹

¹ It is interesting to note that their attempt to enforce an agreement upon the only employer whose workmen were (without exception) non-unionists ended in failure. The men refused to strike

Sub-committees, necessary in view of the knowledge of technical details demanded, were appointed to deal with matters relating to special groups of workmen, e.g., a Sheet Committee was appointed from among the mill-men's representatives to deal with matters relating to the sheet mills. Here the cleavage appeared; and one of the main causes of disruption is to be found in the conditions which rendered such committees not merely useful to the disputes board as instruments for expediting its work, but essential to its very existence. The objects of the disputes committee were "to watch over the general interest of its members, to consider all demands for increases of wages, altered conditions of labour, or demands made by the employers, and decide upon the course and policy to be adopted." The two most important rules were the following :—

"The representation shall be three from each Society affiliated with the Board, the voting power to be one for each delegate present. On all questions embracing a vital principle of wages or altered conditions of employment any Society shall have the right of demanding a vote of the members of the Societies affiliated to the Board. When such a vote is taken, the ballot boxes must be sealed, locked, or closed, and the unopened ballot boxes must be forwarded to an independent person appointed by the Board who shall open and count the same on the date fixed, in the presence of one delegate from each Society affiliated "

"In any grievance arising out of any department connected with the Trade no one Society affiliated shall be allowed to hand in notices or stop work before first submitting such grievance for the consideration of the Board."

Thus the disputes board was invested with considerable power. The constituent societies were deprived of the right to strike without its consent; and when a strike had been declared the subsequent policy was determined by the committee. The system was that of confederation

Consequently, at a meeting of the disputes committee it was suggested—although no resolution was passed—that they should be compelled to fall into line by "blocking raw material," i.e., tinplate bar. It was precisely the policy suggested here that was feared by the Tin and Sheet Millmen, and that partly accounted for their opposition to federation with the Steel Smelters

rather than that of federation.¹ No attempt was made to interfere with the internal management of the affiliated societies; but since the main function of a trade union is to regulate the conditions of employment, the most vital element seemed to be removed. Those who contributed part payment of the piper were never entitled to call the tune.

The rule relating to representation proved highly unsatisfactory. The Gasworkers' Union, although representing but a very small proportion of tinplate workmen, enjoyed the same privileges as the others upon the disputes committee. Voting power bore absolutely no relation to the interests at stake. While it is true that an appeal could be made to the "members of societies affiliated to the Board," for this purpose the workmen of all departments were regarded as one constituency. And a unanimous vote of tinhousermen upon a question affecting themselves alone would still leave them in a minority provided the millmen were ranged in opposition. The members of an executive committee of a trade union naturally enjoy equal power; but the representation of a section or branch upon such an executive is mainly determined by the numerical strength of the electing group. The voting power of a delegate at a general council is also determined by the size of the group represented. Thus, upon both the general council and the executive body a direct or indirect relation exists between the importance of and power exerted by a section. But, although the disputes committee exercised quasi-legislative as well as executive powers, no such correspondence existed. It is hardly surprising, therefore, that its career was stormy and brief.

The method of remunerating millmen employed in rolling plates known as "doubles" and "Canadas" proved a subject of dispute for a number of years. On more than one occasion the employers and the representa-

¹ This form of organisation, it will be seen, presents some points of similarity to the German Kartel system by which capital is controlled.

tives of the Smelters' Society suggested settlement by arbitration, but the disputes committee always refused. In 1903, after a series of compromises, this question proved to be the main cause of a general lock-out. The Steel Smelters' Association then prepared for a long struggle, and wished to force the employers to capitulate. The rival association of millmen was equally determined in its attitude. But the remaining societies, not so seriously affected by the questions in dispute, were prepared in the end to submit the case to arbitration; and, finally, the disputes committee decided, by the casting vote of the chairman (a representative of the Dockers' Union), to accept the proposal of the employers to that effect. The arbitrator decided in favour of the masters upon the vital points in dispute, and a strong feeling of dissatisfaction with the committee existed among the millmen. Consequently, when resignation from the disputes committee was first formally proposed at the district council meeting of the Steel Smelters' Association (in January, 1904), the main reason urged was the inadequacy of representation.

Again, in August, 1903, the disputes committee "recommended" that legal proceedings be taken against a firm which had closed its factory without the requisite notice to the workmen of its intention. In November of the same year, in similar circumstances, the committee refused to do more than recommend to the executives of the affiliated societies that joint action be taken. In the first case the pious resolution did not crystallise in action; but in the second the Steel Smelters' Association acted upon its own responsibility and at its own expense, and obtained an important legal judgment.¹ The refusal of the committee considerably strengthened the feeling of

¹ The wording of the minutes of the disputes committee is so ambiguous that it is difficult to say whether the resolutions expressed different intentions. The Steel Smelters' Association obviously believed that the committee was to be directly responsible for the proceedings in the first case; and that it refused to undertake such responsibility in the second, without first consulting the executives of the constituent societies.

opposition among the officials of the Steel Smelters' Association, and precipitated a crisis.

Finally, the personal relations of some of the leaders were not of the happiest description. Partly in consequence of inefficient management of the affairs of the committee, partly as a result of the competition for members during the period of reorganisation, and partly, it may be, for reasons not directly connected with the industry under consideration, discordant notes were frequently sounded. It is doubtful, indeed, if the difficulties already indicated would have proved nearly so great had the officials been able to work in harmony. Since some of the members were men of exceedingly strong personality, and had become supreme officials in their own societies, perhaps this great weakness from which the committee suffered was inevitable. There was no really supreme official; the chairman was an administrative necessity, not a superior official in whom any real executive power was vested.

Late in 1903 the Steel Smelters' Association convened a joint meeting of delegates of the millmen's societies, and, contemplating resignation from the disputes committee, re-opened the question of amalgamation. A similar proposal had been made to the Tin and Sheet Millmen's Association by the Dockers' Union. But the independent millmen's society refused to consider any proposal involving amalgamation with a society which included other classes of workmen.¹ In July of the next year, after repeated discussions at executive and council meetings, the Steel Smelters' Association withdrew from the disputes committee. Similar action was taken by the Tin

¹ The following resolution was passed at a special Council meeting in December: "That the meeting thinks it unwise to amalgamate with any society which has any interest other than tin and sheet millmen, but are desirous of recording their readiness to co-operate with other unions for the mutual benefit of tin and sheet millmen." Earlier in the year the executive resolved "That we are prepared to convene a general meeting of millmen throughout the trade for the purpose of considering whether or not a separate society should be formed, consisting entirely of millmen, and that such society shall have the right to appoint a general secretary."

and Sheet Millmen's Society two months later,¹ and the committee dissolved. While objective conditions had created many difficulties, none of these seemed insuperable.² The idea of a disputes board was admirable; and if a sufficiently strong man had been in control a valuable organisation would undoubtedly have been created. Such an organisation would probably have made

¹ "To remain in the Wages and Disputes Board with only one half of the millmen, while the other half was outside, would be . . . utter folly."

² The following passage, quoted from the Report for August, 1904, summarises the objections of the Steel Smelters' Association "The Disputes Board was a combination of the various societies with a view of joint action in matters of common interest; unfortunately, however, the tin mills section of that Board whom we represented had no real voice in the deliberations of that body, as a consequence of the chairman of the Disputes Board assuming to himself a privilege that the rules of the Disputes Board did not give him. On many occasions we have been called together to consider questions in which we were not directly interested, causing a great loss of time, quite outside the question of expense. Quite irrespective of this, which is a small matter, we came to the conclusion that millmen only should settle mill questions, leaving to those engaged in the tinhause department the full control of their own policy and programme. The Disputes Board, in the opinion of our members, from whom the proposal emanated, in the first place, and the delegates of the branches composed of tinplate men were strongly of the opinion that our interests had not been advanced by such joint meetings, and the Executive, after very careful consideration, decided that their view of the case was well founded; it was therefore decided to comply with their request to secede from the Disputes Board and make an endeavour to enter into an arrangement and agreement with the Tin and Sheet Millmen's Association to protect the interest of this section of workmen. We shall simply intimate to the employers our desire that as a matter of convenience millmen's questions be considered separately from those of the tinhause. We have no desire to enter into the points of disagreement, but various episodes have occurred where material support has been offered and rendered to the tinhause section, but when questions of general moment affecting all sections were advanced by our delegates such has not been rendered us. The matter of severing our connection with the Disputes Board does not mean that we quarrel with those engaged in the tinhause, but simply that we desire to manage our own business and leave them to manage theirs." The Report of the Tin and Sheet Millmen's Association for October states that "There is no denying the fact that much of the time of the Millmen's representatives has been taken up in the past, discussing questions that did not in the least affect them, and often blunders were committed because the men taking part in the debate did not understand the real grievance under discussion." But the first weakness indicated in the latter quotation is inherent in the system of collective bargaining; while the second represented a phase only. A knowledge of details would have been (and probably was) acquired soon after the necessity for such knowledge appeared.

evident the desirability of a single union for the entire industry, federated, it may be, with the Steel Smelters, if not also with the Dockers' Society, but entirely independent in the management of internal affairs. One suspects that the fear of development along these lines increased the difficulty of co-operation among the officials of the affiliated societies, and rendered impossible a system of representation and government suitable to the requirements of the time.

With the collapse of the Wages and Disputes Board resort was made to the method of "sectional bargaining." The two associations of millmen formed a joint committee for the determination of claims to be submitted to the employers; and, in effect, a separate Conciliation Board for millmen was established.¹ Similarly a Joint Board for tinhousemen was created. Thus the two departments held separate meetings with the employers, but the associations within each department acted jointly. But such a method involved two meetings for the employers, and considerably more expenditure of time and money than seemed necessary. Consequently, a further modification was introduced in 1905. All the unions were again represented at the meetings of the Conciliation Board, but the functions of the delegates differed from those

¹ The following is a resolution passed at a joint meeting of the executives of the Steel Smelters' Association and Tin and Sheet Millmen's Association: "That the two societies jointly intamate to the Employers' Secretary of the Conciliation Board that we desire in future that all mill questions shall be discussed separately from those of the tinhouse, and that those in connection with the mills refrain from taking any part in matters pertaining to the tinhouse, that the employers be requested to arrange for a small joint sub-committee meeting for the drafting of a code of rules for the regulation of all disputes arising in the mills; that the claims of either party, in so far as they seek to amend existing agreements, should be sealed and interchanged not later than April 30th in each year; and that on the first day of May there should be a meeting of such sub-committee, when such sealed claims should be opened and mutually authenticated; that a joint meeting of the two unions be held to decide what claims, if any, should be lodged for the purpose of amending existing agreement, that all resolutions dealing with matters relating to wages and conditions of labour in the mills be interchanged, that, in the event of any difference of opinion between the members of the joint committee of the two unions, such matter be referred to the votes of the members affected, the majority of votes cast in favour of any proposal being then given effect to."

which they performed at first. The claims of each department were submitted in turn, and advocated by the representatives of that department; for example, questions relating to millmen were examined by the employers and representatives of millmen only; and when the workmen's delegates retired to discuss the proposals of the employers, those representing other departments were not allowed to vote. All the delegates retired together, but the deliberations were "departmental" in character. This method of bargaining proved satisfactory, and no serious modification has been found necessary.

The methods of collective bargaining already discussed relate only to "direct workers," the majority of whom are paid on the piece-rate system. No reference has been made to artisans, or "indirect workers," such as fitters, firemen, engine-drivers, etc., who are invariably paid time-wages. Their work, like that of the men (and women) employed in the pickling department, is of such a character as to render payment according to product practically impossible. The amount of work they are called upon to perform depends upon the output of the mills, the character of the boilers, etc. Their occupation differs entirely from that of the direct workers, and little or no mobility exists between the two groups. But while their task is highly specialised, it is not peculiar to tinplate manufacture. The work which they perform is necessary in all factories. A fireman or crane-driver may be employed in a tinplate factory one year and in a steel-works the next. The majority of skilled artisans are members of the Welsh Artisans' Union,¹ but, partly as a result of their mobility

¹ This union was formed in 1889, to "meet the requirements of 'daymen' engaged at tinplate works," but it was not registered until two years later. Since the cost of labour controlled by the association formed but a small proportion of even the total labour cost of manufacture, its position was very strong—the demand for this particular labour was highly inelastic. It was therefore able to improve the position of its members without serious difficulty, and for twelve years it proved unnecessary to declare a strike. Its scope has since been widened, and now "skilled workmen of all trades, approved of by two-thirds of the members present at an ordinary meeting of a branch" may become members, whether they be employed at steel or tinplate factories.

between different industries, a number belong to the Engineers' and Gasworkers' Societies. The last-named society also includes most of the unskilled labourers. Consequently, the workmen employed in tinplate manufacture are distributed among six trade unions.

The indirect workers were outside the scope of wage agreements made at the Conciliation Board. The Artisans' Union was a highly monopolistic combination, and could exercise greater power by remaining outside the Board. And while it insisted upon independent agreements little would be gained by the inclusion of the other associations of indirect workers.¹ But the weakness of a wage agreement which left an entire department unprovided for soon became evident.

In the autumn of 1902, within six weeks of the signing of the annual wage agreement, a demand, accompanied by notices terminating contracts, was submitted by about twenty firemen (employed at six works in the Llanelli district) with the approval and through the agency of the Gasworkers' Society, of which they were members. In spite of the fact that separate agreements were made for corresponding workmen attached to the Artisans' Union, the employers apparently believed that the claim should have been brought before the Conciliation Board, and refused to enter into negotiations with the workmen until notices were withdrawn.² A strike was then declared, and

¹ It will be seen that the Gasworkers' Union included direct and indirect workers. But the society could not legislate for the latter group at the Conciliation Board.

² The following minute was passed in December, 1899, at a meeting of the Executive of the Masters' Association : "The question of firemen's wages was discussed, after which it was decided that as the system of work varied so much at the different works, each employer should try and settle his own case, but should he fail, then the matter should be brought before the Association." This decision was held to be binding upon the employers. But, although it seems to have been accepted by the Conciliation Board, the representatives of the Gasworkers' Society disclaimed knowledge of it. The annual wage agreement was signed by the officials upon the assumption that it applied to piece-workers only. Moreover, the Disputes Board was unable to do more than give "friendly advice," since the matter was believed to be outside its province. No questions affecting indirect workers had so far been dealt with by the Conciliation Board, so that the statement in the text is undoubtedly correct.

about 4,000 workmen, who were not directly affected by the dispute, were thrown out of employment. A special meeting of the Conciliation Board was convened, and the matter was referred to an "investigation committee" for settlement. Ultimately the societies controlling indirect workers were brought into the board, which afterwards legislated for all workmen employed in the industry; and the investigation committee, which will be examined later, became a necessary part of the permanent machinery of conciliation.

The nature of the task performed by the Conciliation Board will be readily appreciated if the following facts are borne in mind. At present there are about eighty tinplate factories in South Wales. In many of these, steel and galvanised sheets, as well as blackplates and tinsheets, are manufactured. When, in 1899, the Conciliation Board was formed, the Welsh Plate and Sheet Manufacturers' Association controlled 225 mills, or about 50 per cent. of the output. In the summer of last year (1913) it controlled 414 mills, or about 80 per cent. of the aggregate Welsh production.¹

The total number of workpeople is estimated to be between 28,000 and 29,000. Of these, probably about 20,000 are skilled workmen, while perhaps 1,000 are unskilled labourers; the remainder consist of boys, women and girls. The labour cost of production, which, fourteen years ago, was about 25 per cent. of the total cost, has been reduced to rather more than 20 per cent.—still a much greater proportion than in most branches of steel manufacture. Altogether there are about fifty occupations, or grades of manual workers. Since several sizes of plates are produced it is necessary to fix over 300 piece-rates for contract workers, as well as a large number of day-rates for artisans. Moreover, special conditions call for special treatment, *i.e.*, provision must be made for the application of general rates to particular cases. And in some branches this problem is, as will be shown, of the first importance.

¹ In the interval the total number of mills in South Wales had been increased from about 450 to 520

About 95 per cent. of adult male labour is either "standardised" (*i.e.*, lends itself to payment according to output) or involves some degree of skill; most of it is both skilled and standardised. About 5 per cent. only is unskilled. While at the end of last century there were considerable variations in the "quality" of the factories, to-day "all the works are comparatively in the same state of efficiency."¹

When, as a result of negotiations between the late Mr. Trubshaw (the Chairman of the Masters' Association, and afterwards of the Conciliation Board) and Mr. John Hodge, the Conciliation Board was formed, about 85 per cent. of the workmen were members of one or other of six unions. But with the exception of less than 100 unskilled labourers (who one month may be employed in a tinplate factory, another month in a totally different industry), all the workmen are now organised. Some of the boys and girls are not members of any union, but when disputes occur with the employers the officials of one or more of the unions render assistance.

At first four unions, controlling "direct workers" only, were represented on the Conciliation Board, but since 1908 all—six in number—which include tinplate workmen have been represented. The men employed at the rolling mills are distributed among three unions (mainly the Steel Smelters' Association and the Tin and Sheet Millmen's Society); tinhousermen are divided among

¹ Evidence of Mr. Frank W. Gilbertson, given before the Industrial Council in connection with its Inquiry into Industrial Agreements, 1913. Cd 6593. Many of the facts relating to the present position of the Conciliation Board have been obtained from, or confirmed by, the evidence given by Mr. Gilbertson (Vice-Chairman, South Wales Siemens Steel Association), Mr. Henry Clement (Secretary, Welsh Plate and Steel Manufacturers' Association), and Mr Tom Griffiths (South Wales Organiser of the Steel Smelters' Association). Minor inaccuracies occur in the evidence, such as in the dates of past events, etc.; but few are important. The leading questions asked by two members of the Industrial Council, Mr F. W. Gibbins (a tinplate manufacturer) and Mr John Hodge (who, as General Secretary of the Steel Smelters' Society, possessed an intimate knowledge of the trade) brought valuable information to light. Undoubtedly the enforcement of standard rates throughout the trade had much to do with the general adoption of the best available methods of production.

three (mainly the Dockers' Union); annealers, engine-drivers, firemen, fitters and smiths among five; while most of the unskilled workers are members of the Gas-workers' and Dockers' Unions. Thus, for example, the tinplate section of the Steel Smelters' Society consists mainly of millmen, but also includes annealers, a few day-men, girl "openers," and some boys employed at the cold rolls. None engaged in the tinning department are members of this society.

It will be seen that the Conciliation Board operates in a strongly localised, compact, highly organised industry, employing, for the most part, skilled workmen, engaged in the manufacture of a highly standardised product. Each grade of labour is distinctive, and practically no "demarcation" difficulties arise. Finally, although labour is a highly important item of cost, the general conditions of the world market are such that, within limits, a uniform rate of wages, fixed for definite and fairly long periods, is a much more important factor in the progress of the industry than a low rate of wages. And the success of the Board is partly due to these favourable conditions.

The Conciliation Board consists of a joint meeting of representatives of masters and workmen. Each of the unions represented is allowed to choose any number of delegates, and usually the officials, together with from three to six other members, attend. Since questions are never voted upon at the joint meeting equality of representation is of no importance. Adequacy of discussion is the main essential. But so many unions are represented that the meetings are apt to be large and somewhat unwieldy. When proposals are submitted by the masters the workmen's representatives retire, but only those whose constituents are directly affected by the proposals take part in the discussions. Nevertheless, at the joint meeting a representative of any union may speak, even if the question under consideration does not affect his own men. In this way the workmen's delegates often assist each other in an informal way.

The Board has no written constitution, but a number of rules are inserted in the wage agreements, while many customs, which will be dealt with in turn, have been observed so long that they now possess the force of law. The President of the Masters' Association acts as chairman of the Conciliation Board. Meetings are held annually—in May—and agreements are made for the year commencing the first day of July. For many years claims were sent in at the last moment, but since 1908 the rule (passed three years before) has been enforced that all demands shall be submitted not later than May 1st. In this way a careful preliminary examination of the claims is secured by the other side; and since, in practice, these are often posted as late as possible, counter-claims cannot easily be submitted, merely for the purpose of creating a "margin for conciliation." Nevertheless, speculative demands are often made which the claimants do not intend to press, but which are merely employed as instruments for bargaining.

The practice of holding meetings annually rather than making them contingent upon disputes has proved successful. For although there are always claims to be considered which might not arise without such periodic meetings, they never cause serious trouble. And a meeting for the discussion of trade matters in an atmosphere of peace and goodwill seems to be a real influence for good. Its effects are evident when trouble next appears. Furthermore, since an agreement is binding for a year, and revision is impossible during its tenure, ephemeral disputes, in which immediate conciliation might be difficult, do not often influence discussions at the Joint Board. Adequate machinery for the settlement of minor disputes in the interval has been constructed. Probably the success of this method of conciliation adopted is mainly due to the effectiveness of such machinery.

(1) In 1902, although the Conciliation Board succeeded in fixing the general terms of the wage agreement for the ensuing twelve months, a number of minor differences remained unadjusted. To deal with these a sub-committee,

upon which the two sides were equally represented, was appointed. This method of adjusting the details of an agreement has since become the custom; *e.g.*, the printed wage-agreement of 1911-12 states that "certain claims have been referred to Joint Committees¹ for settlement." Thus, failing agreement at the Conciliation Board, minor differences are now always referred to a committee of three employers and three union delegates. If the committee fails to adjust matters appeal is made to an independent umpire. But only once since 1909 has it been found necessary to call in the services of such a person.

It is often supposed that when no settlement is arrived at by the Conciliation Board the difference, whatever may be its character, is automatically dealt with by the small committee. Such is not the case. The Board would scarcely allow itself to be bound by the decision of a sub-committee upon a vital question. But it is difficult to adduce formal evidence in support of this view. For nearly all the deliberations of the Board, since the re-establishment of the standard rate in 1899, have been concerned either with questions of relatively small importance or with the serious problem of re-modelling old customs to suit new conditions, introducing uniform conditions into all branches where that was possible, etc. In 1903, as already indicated, the most serious dispute in the history of the Board occurred, mainly over the method of payment for certain kinds of plates known as Canadas and Doubles. This question, which was carefully examined for three years before the crisis arrived, resolved itself into the reading of a custom which appeared to have crept in almost unobserved, and which was not recognised by the Employers' Association. Ultimately, after a brief stoppage of work, it was submitted, along with other

¹ Two or three committees are sometimes necessary, because the employers' representatives deal separately with the groups of unions representing different departments, *e.g.*, one committee would be appointed (if necessary) for dealing with mill questions; the Gas-workers' Society would not be represented upon this. Another would be formed to examine minor claims in the tinhouse, the Steel Smelters would not be affected in any way.

questions, to an arbitrator appointed by the Board of Trade. It is important to observe that the employers had advocated arbitration long before, obviously because they realised that no such custom was recognised as the men believed to exist. None of the important questions submitted to the arbitrator involved new principles: they simply called for a definition of the prevailing customs. Nevertheless, so important were they that not until the final rupture was a sub-committee appointed to deal with them. For three years they had been discussed at special meetings, as well as at the statutory meetings of the Board.

Again, in 1907 and 1908 the employers refused committees to deal with questions relating to sheet-mills. These involved the reconsideration of the distinction between blackplate and sheets, and so raised a question of principle. It would appear, therefore, that only differences of the character already indicated were (and are) remitted to the committee.¹ Naturally, no reference is made to this committee in the rules inserted in the wage agreement.

While the Wages and Disputes Committee was in being the agreement was of a simple character, and was signed by the representatives of the composite body and the masters' association. But now that the method of "sectional bargaining" has been introduced a composite agreement is made, and the representatives of the labour associations sign for that part which affects their constituents. Nevertheless, the agreement only becomes operative as a whole, when all the workmen's officials have signed it. When, at a joint meeting in 1908, one of the officials threatened to withhold his signature, the chairman of the Board replied: "Then these proceedings come to an end. We are not going to have one signing and one not."

The following clause is now inserted in the agreement: "That any settlement as to wages and conditions arranged

¹ If this conclusion is true, the evidence of Mr Clement, otherwise admirably clear, is somewhat misleading, for he implies that all questions which are not settled at the Board meetings are referred to the committee.

or the ensuing year will only be operative from the date upon which an arrangement is completed with other sections of the trade."

(2) The *annual* wage agreement, although binding upon all, fixes the precise rates paid to "direct workers" only. Their work, as already indicated, is highly standardised, and in most cases lends itself to payment according to output. Particular variations in the wages of skilled artisans, the vast majority of whom are engine-drivers, firemen, bar-cutters, fitters and smiths, are otherwise determined.

It will be remembered that in 1902, when the Conciliation Board determined the conditions of employment of direct workers only, a serious dispute occurred at Llanelli, where the action of about twenty firemen (members of a society already represented on the Board) brought into prominence the weakness of the existing arrangements. To remedy the defect the following resolution was passed at a meeting of the Board: "That an investigating committee of three masters and three men should visit each works where dispute has arisen with firemen and endeavour to arrange conditions of work and rate of wages to be paid at each individual works, and that in the event of disagreement an umpire should be appointed by such committee. That no further demands be made. That work be resumed as soon as possible under the old conditions pending settlement." Those day-men who were members of societies already affiliated were thus brought under the control of the Board. Some years later the Artisans' and Engineers' Societies were affiliated, and the following rule, based upon the above resolution, was inserted in the wage agreement: "If any dispute arises in case of employees not included in the wage agreement, Committee of three masters and three men shall discuss the matter, and, failing to agree, the matter shall be referred to the Conciliation Board for settlement. All disputes shall be settled within a reasonable time."

A uniform rate to day-men is impossible, because the conditions of work vary so widely from one factory to

another. The work of a fireman, for example, varies with the steam pressure, the sizes and number of boilers, etc.¹

Although the rule states that the committee shall report to the Board "for settlement," this is not done in practice. If the committee cannot agree the case is referred to an arbitrator.² Two such cases have been submitted to arbitration since 1909. During the same period forty-three disputes were settled by the committee, while in 1909 alone (an exceptional year) nearly 2,000 claims were settled at conferences of the officials.

Since conditions may change at any time, detailed rates cannot be fixed for a definite period, so that, unlike the direct workers, day-men may submit (or be called upon to meet) claims for alterations during the tenure of the general wage agreement. Nevertheless, the general conditions of employment, such as the standard number of hours in the working day, the weekly income implied in the determination of the particular rate, etc., are laid down by the Conciliation Board, not by the committee, and, having been agreed to (explicitly or by implication), are binding for a year; so that a demand for a general increase of (say) 10 per cent. in wages, or a reduction in

¹ "I said distinctly that there was no possibility of uniformity as far as artisans and labourers and firemen are concerned, and under our rules these things will have to be dealt with on their merits by a committee of three men and three masters" (The Chairman, Minutes of Conciliation Board Meeting, 1907.)

² "If there is any claim for men who are not covered actually by this agreement, that claim is first of all investigated by me and discussed by me as the employers' secretary with the representative of the union that makes the claim. If we, that is to say, the employees' representative and myself, fail to agree, then the men's representative has the right of asking for a committee. My duty then is to report the matter to the chairman, and he decides upon three members of our executive to represent the employer in the dispute, while the workmen's representative elects or appoints three men. In the event of their not agreeing the matter goes to arbitration."

"Do they (claims) go before the Conciliation Board?"

"No, they are dealt with by me and the union officials, or failing us, by a committee."

"And failing a committee?"

"Failing the committee, then an umpire."

(Evidence given by Mr. H. Clement before the Industrial Council in connection with the Inquiry into Industrial Agreements)

the hours of labour at all factories would be examined by the Board as a whole.

(3) A third committee is needed for a slightly different purpose. The annual wage agreement fixes the standard rates of wages, and the general conditions of work. But it is further necessary to apply a general agreement of this character to factories which sometimes deviate considerably from the normal in some respects. Disputes upon questions of custom, interpretation and application (failing settlement by the officials of the organisations concerned) are submitted to an interpretation committee. Such a committee has been employed ever since the first agreement was made, but apparently it only came to be recognised as a necessary part of the permanent machinery of conciliation in 1902, when, in connection with the decision to abolish the custom of limiting output, a resolution was passed containing the following clause: "In case of dispute at any of the works, a committee of three masters and three men shall visit such works and report to the Conciliation Board for settlement." Since then this clause has appeared in all wage agreements.¹ Such work as the committee had to do at first consisted chiefly of checking the tendency to "drive" the workmen in certain factories; but now it is not often needed. Petty disputes about breakages, defective machinery, etc., as well as complaints about "driving" on the part of the employer and shirking on the part of the men, are settled with comparative ease by the officials of the organisations, acting in conjunction with the individuals affected. Moreover, the machinery is so completely standardised, and the agreement so well understood that no difficulty is experienced in matters of interpretation and application. When recourse has been made to the committee it has never failed to effect a settlement. It will be observed that in practice the committee does not report to the Board

¹ "We can't legislate to meet every trade. We must go into generalities, and find out fairly and squarely by sub-committee if any disputes" (Minutes of the Conciliation Board, May, 1908 A statement by Chairman.)

"for settlement," but settles the dispute without assistance. If its efforts proved unavailing, probably the service of an arbitrator would be requisitioned.¹

(4) Finally, a committee is required to deal with sheet mills. When the tinplate trade revived in 1899 a few employers began to manufacture steel sheets. These are practically large blackplates, 54 in. \times 28 in. (and over) in size, and the mills in which the sheet bars are rolled into sheets are similar to, though generally somewhat larger than the corresponding tinplate mills. Naturally the Conciliation Board was called upon to fix piece rates applicable to such mills. For this purpose those employers who manufactured sheets formed a joint committee with a sheet sub-committee of the Wages and Disputes Board. At first this joint committee formed a wing of the Conciliation Board rather than a sub-committee subject to its control.² But, as time went on, standard rates were fixed, while the number of tinplate factories containing sheet mills increased considerably. Ultimately the sheet committee became a sub-committee of the Board, similar to those already described. Indeed, it may be said to have disappeared, or merged into the first and third com-

¹ The real difference between the second and third committees is that the former deals with day-men and the latter with piece-workers. The former is much more frequently required than the latter. But since no general demand for a big change in the conditions of employment has been made by indirect workers since their inclusion, it is often taken for granted that the committee which deals with them really determines their conditions of employment, and the underlying assumptions indicated under (2) are forgotten. But, in spite of the quotations from the late chairman's remarks, if an important question affecting all indirect workers alike were raised it is evident that the Board would deal with it. In the case of piece-workers the standard rate is in the foreground, and the interpretation committee in the background; in the other the committee is in the foreground, while the assumptions which restrict its operations are almost out of sight.

² "Then there is the question of the rearrangement of the sheet mill rates. The masters will probably meet a committee of your workmen, because they will be few in number—therefore it will be better to have a *separate meeting as hitherto*. Mr Jones a fortnight ago undertook to call a meeting, and he has arranged for a meeting; because the item is on that list, the sizes above 54 \times 28 will be considered by that joint committee" (Minutes of Conciliation Board. Statement by Mr. Trubshaw, Chairman.)

mittees. For new claims relating to sheet mills would now be examined by the Board, and, failing agreement, might be submitted to the first sub-committee described above.

None of these are standing committees; the employers are selected by the chairman, and often consist of those who live at a convenient distance from the scene of dispute. For the settlement of differences relating to the application of an agreement to sheet mills, probably employers with the necessary experience would be selected.¹ The officials of the millmen's unions would naturally represent the workmen on the Committee.

It is doubtful if there exists in the country an industry in which the belief in collective bargaining is stronger and finds fuller expression than in the one under consideration. And yet less than fifteen years ago chaos prevailed. The change is not due merely to the creation of an effective instrument of conciliation. The confidence of both parties has certainly been strengthened by improvements in that instrument. But it is also due in large measure to the high degree of control exercised by the associations represented upon the joint board. Such control has resulted in successful enforcement of all the agreements made between employers and employed, as well as of the awards of the arbitrators. No serious difficulty has ever arisen through non-observance of agreements; nor has it ever been found necessary to make provision for cases in which the award of an umpire might not be accepted in the right spirit. If the workmen do not observe their agreements they sacrifice the "friendly benefits" of the Union.

The following rule appears in the wage agreement: "That the rates paid, and the conditions, must not be more favourable than the foregoing to works outside the Employers' Association." This condition, which was laid down in the first collective agreement, has always been

¹ Mr. Hodge: ". . . You simply delegate the sheet matters to the sheet mill men."

Mr. Trubshaw. "Yes; I do it because I don't understand it." (Minutes of Conciliation Board, June 6, 1905.)

faithfully observed. At first great difficulty was experienced with some of the independent employers, and serious strikes at individual factories were necessary to bring them into line. But so complete is the organisation of the workmen that no employer is now able to engage labour at rates below the standard. Indeed, some of the non-associated employers are said to be paying more than the association rates for certain classes of work;¹ so that they are actually penalised for their independence. The Conciliation Board thus legislates for the trade as a whole. Probably this has reacted favourably upon the masters' association, which now controls about four-fifths of the output.

The annual agreement, which deals with rates of wages, hours of work, and conditions of employment, is not a legal contract, but provides the basis of such contract between the individual workman and his employer. The period of engagement of labour is one month, and notices terminating contracts can only be given on the first Monday of any month.

Naturally, breaches of agreement, such as inexcusable conduct, drunkenness or inefficiency, are sufficient reason for instant dismissal. And in such cases the disciplinary measures of the unions are no less severe than those of the employers.

It is an unwritten law that no workman, employer, or association shall give notice during the investigation of a subject of dispute. If such notices are tendered by workmen without the authority of the union they must be withdrawn. If the men persist in their action they sacrifice their contingent benefits from the union.² It is evident, therefore, that the control of a union over its members is partly secured by the provision of such friendly benefits. Reference will be made to this point later. If a few workmen strike without notice and are

¹ The trade unions generally refuse information to the independent employers regarding those rates (to day-men) which are not tabulated in the wage agreement.

² In some cases in the past they were fined £2. The fines were afterwards remitted.

dismissed by the employer, they are not supported by the union; they virtually cease to be members. In practice the employers generally take a lenient view, and little difficulty arises. But considerable time is sometimes lost in compelling insubordinate members to return to work, and employers and workmen suffer through the resulting dislocation.

If any organisation tenders notices terminating contracts, negotiations automatically cease. It is obviously an advantage that all disputes should be investigated while the men are at work. For all the time of investigation the men receive full wages. A much more conciliatory spirit prevails. And the settlement need not be hurried: the award may be made retrospective. Similarly, if the annual wage agreement has not been completed by the first of July the *status quo* is maintained until the rates, which are made retrospective, are definitely fixed. Thus it sometimes happens that the first sub-committee of the Board does not complete its task for some time after the new agreement is put into operation.

The contrast between the last decade of the 19th century and the first of the present is so striking that it would be surprising if tinplate manufacturers did not believe in collective bargaining. During the nineties local strikes were of almost monthly occurrence. Since the formation of the Conciliation Board so few stoppages have occurred through disputes that they are worth enumerating. In 1903 the long-standing grievance over the payment for plates called "Canadas" and "doubles" resulted in a general lock-out which lasted a little over a week. The dispute was settled by arbitration. In 1908 an unauthorised strike occurred at a small works, but the men returned to work in three days. Two years later a section of the men at another factory struck work for a week, without the sanction of the union. Apart from these disturbances peace has reigned for nearly fifteen years at all the factories controlled by the employers' association.

For some years before 1899 wages rates varied from

place to place and from time to time. Contracts for future delivery involved considerable risk to the manufacturer. Improvements in the methods of manufacture were delayed. Since 1899 the standard rate has been maintained to piece workers generally; slight increases have been granted to millmen;¹ considerable advances have been granted to indirect workers, and improvements in the general conditions of work have been effected. On the other hand, the universal enforcement of the standard rate for long periods without interruption has reduced the risks to manufacturers in introducing new methods and in making future contracts.

It is stated that during this period the cost of labour has advanced $12\frac{1}{2}$ per cent., mainly through advances in one or two departments² and changes in custom—the standard rate for the vast majority remains unchanged. This does not imply an increase in the proportion of labour cost to total cost of manufacture. For, while in the early nineties, before the introduction of labour-saving machinery, the labour cost was 25 per cent. of the total, now it is only a little over 20 per cent. when the price is about 13s. per box (f.o.b. less 4 per cent.). Other elements in cost have advanced in almost the same proportion as labour. It should also be observed that the above refers to the labour cost per box of tinplate. Although the standard piece rates have remained stationary, the weekly earnings are estimated to have advanced about 20 per cent. in the majority of factories. For the improvements already referred to in an earlier chapter, together with the abolition of the custom restricting output, have increased the producing capacity of the typical factory to that extent.

So evident are the benefits that have been derived from

¹ Until a few years ago 2 per cent. of the weekly wages was deducted for waste involved in the process of manufacture, this custom has been abolished.

² ". . . Owing to doing away with certain customs which the men formerly had included in their wages, and an advance in one or two departments, the cost of labour to-day I should put down at about $12\frac{1}{2}$ per cent. more than it was in 1899." (Evidence of Mr. H. Clement before the Industrial Council)

collective bargaining under favourable conditions, that now many of the employers believe in "compulsory unionism" as strongly as the men. They compel defaulters to pay arrears of contributions, and, in some cases, have even assisted them to do so (by advancing the money and deducting it in small sums from the weekly wages); so that the unions find less difficulty than most in dealing with "laggards." Some employers encourage boys to join an association early, by paying their entry fee.

Perhaps the main difficulties at present are created by the existence of more than one union in the trade. Reference will be made to this point later, but in this connection it should be noted that multiplicity of unions makes for instability. Indirect workers attached to one union may make an unsuccessful appeal to its executive to demand an advance in wages. In such a case they might be strongly tempted to resign membership and enter a rival union which is more likely to accede to their request. Competition between unions undoubtedly weakens discipline, and may yet prove a disturbing factor.¹

It would be difficult to praise too highly the work done by the Conciliation Board. It would be equally difficult to exaggerate the contribution of its first chairman² to its success. Nevertheless, it is necessary to emphasise once more the distinctive features which simplified the task of the members. The high degree of geographic concentration of the industry simplified the task of enforcing agreements, and secured that general intimacy, now so marked, which renders the existing method of conciliation easy of application. The precise conditions obtaining in nearly all the factories are well known to most of the members of the Board, and such knowledge tells in every discussion.

Even more important is the second feature. The formation of the Board synchronised with the return of pros-

¹ See evidence of Mr. Gilbertson before the Industrial Council.

² The late Mr. Trubshaw.

perity—indeed, was made possible by it. And the general state of trade remained satisfactory until last year, when severe depression set in. Even then it was obvious that little was to be gained by a moderate reduction in the wages rates.¹ The general demand remained inelastic about the prevailing prices. Consequently, the Conciliation Board has not yet been put to the supreme test. Nor is it likely to be for some years to come.

What would happen if the Welsh tinplate industry were subject to keen competition in a number of foreign markets it is difficult to say. For in that event a moderate fall in wages might produce a material effect upon the prospects of the trade, and the employers would undoubtedly seek such relief. It might be argued that tinplate workmen would still enforce the standard rate without difficulty, just as steel workers now maintain high tonnage rates in spite of keen foreign competition. The cases are not analogous. For in the steel industry not only is labour a relatively small element in the total cost, but only a small proportion of workmen receive exceptionally high wages; so that a fall in tonnage rates would not materially influence cost of production. But a large proportion of tinplate workmen enjoy high wages, while labour is a relatively important element in the total cost, so that a general fall of 10 per cent., which would still leave the bulk of workmen well-paid compared with those engaged in other skilled industries, might effect a sufficient reduction in total cost to enable the employers to retain a market which would otherwise be lost. None of the questions which the Conciliation Board has had to discuss were so vital as this one would be. The vast majority have been of minor importance, which could be submitted without fear to the sub-committee.

The general policy of the new unions is more progres-

¹ The American market (the United States rebate and the Canadian orders) could not be recovered by a reduction of, say, 10 per cent in the standard rate. Nor would such a fall stimulate trade with the Balkans. Finally, the evil of over-production, in so far as it was caused by over-building of mills (see Chap. VII) would not be materially lessened in this way.

sive than was that of the strike societies which existed during the last quarter of the 19th century. No attempt has so far been made to prevent the introduction of new methods. The result is that although no fundamental changes have taken place in the character of the machinery, many minor improvements have been introduced which, in the aggregate, have appreciably reduced the net expenditure of human effort required in the manufacture of a box of tinplate. It is true that the economies effected during the present century have not found full expression in cost. The effect has been partly hidden by an increase in the wages of certain classes of workmen.¹ Moreover, the money cost of manufacture varies with the prices of raw material, and these have shown a decided tendency upwards since the trade revival in 1899.

Nor do the existing unions officially countenance the attempts which are still occasionally made by workmen in some factories to restrict the daily output. The custom of limitation was abolished in 1902, but for many years previously it had been entirely disregarded in some and periodically disregarded in all places. The defence of restriction (as a general policy) offered by the workmen had never been convincing. Nor was it officially recognised by the employers until the formation of the Conciliation Board, when a standard output of forty boxes per shift of eight hours was agreed to at one of the earliest meetings. But from that time the employers repeatedly demanded the complete abolition of the custom. Limitation of output naturally involved higher standing charges per box. But equally important was the addition to cost resulting from depreciation and waste. Since an output of thirty-six boxes was well within their powers the millmen worked intermittently, so that the rolls often grew cold. And frequent changes in temperature resulted in more breakages than would otherwise have been the case.²

¹ See p. 226.

² "At the works I represent, a few months ago I had a deputation from the men complaining about the bad orders they had. They had

Moreover, the product was affected. The plates frequently stuck together, and defied the attempts of the girl "openers" to separate them. Since they were then thrown aside the millmen received no payment for them. For this reason quarrels between the openers and the millmen were of common occurrence. Where the men "followed the machinery" the rolls were kept at an even temperature, "stickers" were less frequent, and less labour on the part of the millmen and openers was wasted.

Again, uniformity of "make" does not necessarily imply equality of effort. The production of the standard output necessitated much greater effort in a poor mill than in a well-equipped one, while thirty-six boxes of plates of "odd" sizes could not be produced so easily as a similar quantity of uniform size and gauge.

It was only after repeated discussions extending over a period of three years that the workmen's representatives consented to the abolition of restriction. The National Executive of the Steel Smelters' Society appeared to be on the side of the employers from the first, but the District Council, which controlled the tinplate trade,¹ not only adhered to the policy of limitation for tinmills, but

so many cross plates to work, and they asked for good orders as they used to have. I told them it was a question of make, and when I could get a good order of light plates I would, but I did not believe in getting light plates unless the men followed the machinery. They promised, if I got orders for light plates, they would do a great deal better in the future than in the past. The result has not been so. Only a fortnight ago we had to work very light plates and very good orders. The roll turner told me that when he came down on Friday the men simply dawdled over their work. On the Saturday morning the men were simply working in a casual, lazy sort of way, and I asked the roll turner why the men had not finished and gone, and he said they had passed a resolution in their lodge that no man had to finish work till Saturday at twelve under certain penalties. If the opening men were members of your union I feel you would have had some complaints, because they told me that opening the plates was like skinning eels. Working these orders, I have no doubt they had four or five boxes of stickers every shift. We were stopped a shift. That is one cause of breakages. The men made no attempt to make up those shifts in any shape or form. It practically comes to this, there shall never be more than 640" (Minutes of Conciliation Board.)

¹ See p. 237

extended it to the sheet mills which had recently been erected. A "fair day's work" was said to consist of output of thirty-six boxes per shift from June to September and forty boxes for the rest of the year, allowing a weekly "drawback" of three boxes per shift for breakages. The Tin and Sheet Millmen's Association, largely influenced by the tradition of the parent society, were at first even more strongly opposed to change; and in the spring of 1900 they unhesitatingly refused an advance of $2\frac{1}{2}$ per cent. in wages offered on the condition that the workmen followed the machinery.

But in spite of repeated resolutions at executive and council meetings in favour of restriction, the custom was not successfully enforced, and in the majority of factories the output per shift exceeded the maximum, and the weekly output was above the average officially recognised. The first big step in advance was made in November, 1900, when the following minute was accepted by the workmen's representatives at a meeting of the Conciliation Board: "That the men's representatives are asked to impress upon the men their duty to endeavour to the best of their ability to make up work lost in consequence of any stoppage or bad orders, so as to make an average of 640 boxes net per week over the three months, to come into force on January 1, 1901." During the next few months the policy of restriction was so generally disregarded that the governing committees resolved to leave the matter entirely in the hands of their representatives upon the Board, and in July, 1902, the custom was officially abolished by the acceptance of the following resolution: "It is agreed on behalf of the workmen to follow machinery consistent with efficiency of the same and careful regulation of orders being determined for individual works; also that we instruct our members to utilise the full period of time of their turn and the machinery in use. In case of dispute at any works a committee of three masters and three men shall visit such works and report to the Conciliation Board for a settlement."

It is significant that during the discussions at the board meetings no attempt was made by the workmen's representatives to defend the traditional policy. They mainly emphasised the necessity for "safeguards." They pressed for a specific *minimum* output, a guarantee that adequate mill power and ventilation would be provided, and security against driving. A guaranteed minimum output would ensure a just distribution of orders and approximate equality of weekly earnings in the same occupation. Without this, heavy orders might be concentrated upon one mill and light orders upon another, so that identical efforts might be followed by unequal earnings. But such a guarantee was obviously impossible. Security against "driving" was thought to be provided by the formation of an investigation committee. It appears, however, that for some years it did not prove sufficient, and complaints were frequent that millmen were expected to accomplish the impossible. If rollerman A produced more than B the latter was "brought upon the carpet." But this evil is not now so apparent as it was ten years ago. At first many of the workmen did not take kindly to the new regulation, and in some factories secret attempts were made to restrict output. But the unions faithfully observed the agreement; and now that sufficient time has elapsed for the old policy almost to be forgotten, the method of payment by piece rates is generally sufficient guarantee of adequate effort.

The futility of the old policy was recognised by the workmen's representatives long before the change was made. But for some time they were unwilling to make the concession without some return from the employers. It was used as an instrument for bargaining during the controversy over the method of payment for "Canadas" and "Doubles." The leaders argued that it would be easier to persuade the men to accept the new regulation if the employers conceded other points in dispute. But it failed in this respect, and it was probably a mistake not to accept the offer of a general advance in piece rates made in 1899 by the employers. The frequency with which

the old custom was disregarded by the workmen was ample evidence that no serious difficulty would be encountered with the men; indeed, the representatives afterwards defended their progressive policy by stating, in the monthly reports of the unions, that the action of the men themselves had made the retention of the custom impossible. And soon complaints were made that a number of millmen had taken advantage of the new conditions to work beyond their powers, and to set an impossible pace to their weaker brethren. Since the proportion of rolling mills to tinning sets remained practically constant, it follows that developments in the finishing department kept pace with those in the mills.

The main factors upon which the success of the Conciliation Board depends have been examined at considerable length. The efficient machinery which has been constructed has played a considerable part, while the long-continued prosperity proved a favouring condition. But the main cause was found to be the comprehensiveness of the labour associations. Successful unions capable of enforcing agreements upon all the independent employers were a pre-requisite of the new method of collective bargaining. It remains now to indicate the chief causes of the enormous difference in strength between the old and new unions.

It will be evident that the Conciliation Board itself is a contributing factor in the success of the existing unions. A couple of years' experience of the Board changed the attitude of the majority of the employers towards unionism, and the pressure brought to bear upon the workmen by such employers increased the numerical strength and the stability of the societies. That membership of a union is (in effect) a condition of employment at most of the factories is a sufficient guarantee of success. But it does not explain the strength of the unions in factories outside the control of the association. During a period of prosperity, however, even independent employers are forced to recognise the value of labour organisation. Industrial peace is necessary to them while

it is enjoyed by their competitors. But during periods of depression they would regard the union with disfavour, since it would resist any attempt to reduce wages. Their attitude is that which was characteristic of the body of employers before 1899. The success of the existing associations must, therefore, be partly due to other factors.

The wage protecting associations of 1871 and 1887 (known as the unions of Lewys Afan and Tom Phillips) were created during periods of rising prices. The latter was relatively strong at first, and while the boom lasted it succeeded in maintaining the standard rate. But it never acquired sufficient strength to make membership compulsory upon all the workmen. Nor does it appear to have contemplated compulsion. Moreover, being but a strike society it failed to maintain its strength, and when depression set in a large proportion of members seceded. And the revivals of 1895 and 1896 were of short duration. Once the standard rate had been recovered the society lost its attraction. Many even of those who remained were members in name only, and rarely paid subscriptions. Again, throughout the period of its existence the union had to deal with a body of employers, most of whom were strongly opposed to collective bargaining.

The new associations of piece workers either were formed or began to admit tinplate workmen to membership at the beginning of the last trade revival. The initial success achieved by the organisers was greater than that of their predecessors, mainly on account of the experience of the workmen during the long depression, but also partly on account of the competition among the societies.¹ The majority of the workmen at nearly all the factories joined one or other of the unions, and 85 per cent. of all employed in the trade were enrolled. Consequently, it was a comparatively easy matter to compel the remainder to join. And compulsory unionism in itself makes for stability. For not only is it extremely unlikely that the majority of a branch will resign without very good reason,

¹ That the industry is so strongly localised was an advantage as compared with other industries.

but strong pressure can be brought to bear upon a small minority of backsliders. The threat of a strike is generally sufficient to secure payment of arrears by a "laggard." Thus the initial success achieved by the new unions provided a momentum which would itself have carried them through many years.

Again, the new unions were not tested, as the parent union was, by depression of trade during the critical period. And the success of the Conciliation Board during the first few years, when trade was brisk and prices were high, produced a complete and permanent change in the attitude of the employers, who were content to give the new method of bargaining a trial during a period when peace and uniformity of wages rates were earnestly desired. The earlier union was much more unfortunate in every respect.

Probably the intervention of able and experienced organisers also proved an advantage. The Steel Smelters' Association had already done excellent service among the steel workers, and its officials enjoyed the confidence of the employers, some of whom were also connected with tinplate manufacturing firms. But it should not be forgotten that the Tin and Sheet Millmen's Association, one of the new group, was the successor of the defunct union, and was at first governed mainly by the same officials.¹

Finally, the new unions were registered friendly societies. Perhaps the chief single cause of success is to be found here. The payment of friendly benefits enables disciplinary measures to be taken which are beyond the reach of a strike society. The fear of losing such benefits is generally sufficient to induce defaulting members to make good the arrears and to prevent indifferent members from seceding.

The history of labour organisation in the tinplate industry suggests that strike societies are altogether unsuited to a certain type of industry. Where little capital is employed such societies may enjoy considerable

¹ Mr Tom Phillips was secretary for a few years, until he was overtaken by an illness which proved fatal.

success. The employer has much to gain by reducing wages, and little to lose by fighting for such reduction. Consequently, the ever-present fear that wages will be tampered with at the first opportunity provides sufficient binding force, and little more is needed to preserve the numerical strength of a union.

But in highly capitalistic industries, where the standing charges are heavy and cessation of work involves much expense to the employer, the gain per unit of output from a moderate fall in wages is likely to be inconsiderable, and may be counterbalanced by the cost incurred in the effort to secure it. Thus there is less danger that individual employers will pursue such a policy, and once the standard rate has been secured the workmen believe they have little to gain by remaining members of the union. Hence a stronger bond than the constant fear of a fall in wages is necessary; and this was found in the friendly benefits which were paid by many unions. It is significant that when the Dockers' Union admitted tinplate workmen a separate "emergency fund" was created for them, out of which benefits were to be provided for which other members were not eligible; in other words, when a strike society consisting of members employed by masters who required little fixed capital entered an industry in which each employer had to meet heavy standing charges, it was found desirable to form a separate section which, in effect, became a trade union performing the double function.¹ The tinplate workmen attached to the Dockers' Union managed their own financial affairs.

It is undoubtedly true that if Phillips' union had made provision for the payment of friendly benefits it would have enjoyed far greater success. Twice during the period of depression the 1874 list was recovered; but on both

¹ "Friendly benefits" include out-of-work pay, superannuation and accident benefits, as well as those generally paid by friendly societies. A trade union performed the double function if it provided one or more of these. In the text the conditions prevailing before the Insurance Act was passed are dealt with. The probable ultimate effects of this Act upon trade unionism cannot be examined here. But the above considerations are strictly relevant to that difficult subject.

occasions success was followed by numerous secessions from the union. There seemed no further reason why the men should pay contributions.

This chapter would be incomplete without some reference to the forms of government adopted by the unions attached to the Conciliation Board. The constitution of the Tin and Sheet Millmen's Association calls for little comment. It is essentially that of the parent union. Being confined to a strongly localised industry, the society is governed by a general council and an executive. The latter, which is subjected to the control of the council, is appointed by the general body from a list selected by the branches : every branch nominates its own members, or a member of another branch in the same district. A branch is represented upon the general council by one delegate, whose voting power varies with the number of his constituents. As in the case of the parent union, the local branches are grouped into districts, governed by district committees. The Artisans' Union is also confined to South Wales, so that the general council is at once the supreme body. But the method of appointment of delegates is different. Representation varies with the size of the branch, so that a delegate has but one vote. The other main point of difference is that no district committee is here interposed between the branch and central authorities.

The constitutions of the Steel Smelters' and Dockers' societies are quite unlike the above. While these unions together include the majority of direct workers engaged in tinplate manufacture, in each of them this group forms a minority of the members; the remainder are spread over a much larger area and employed in other trades. Both are national societies and have established the appropriate form of government. The Smelters' Society is divided into districts, each of which is governed by a district council. Since the area of control extends from Glasgow to Llanelli, government by general council is impossible. Consequently, the supreme control is vested in the National Executive, upon which the districts are represented roughly in proportion to the membership.

Although, theoretically, sovereignty may be claimed for the people, in practice the national executive is supreme in matters of general interest. It is not responsible to any representative assembly, although its members are answerable to the councils of the sections which they represent. It follows, therefore, that much greater power is delegated to the district parliament. Since the steel and tinplate trades were quite distinct, two such parliaments were set up in South Wales. And the one established for the tinplate industry is supreme in all important matters relating to its own people, except the declaration of a strike and the control of funds. It is practically certain, indeed, that the national executive cannot coerce the local body. Secession would be so easy that the former cannot be said to exercise any real control over the latter. But the advantages of affiliation with the workers engaged in the production of the raw material are so manifest that there seems little danger of separation in the near future. The Dockers' Union, too, is controlled by a national executive and divided into districts, of which there are two—Newport and Swansea—in South Wales. When tinplate workmen were admitted the Swansea district was divided into three sections, dock labourers, tinplate workmen, and those engaged in miscellaneous trades.¹ For the tinplate sections of Swansea and Newport districts an emergency fund, controlled by a special trade committee, was created, so that something approximating to the district council of the Steel Smelters' Society was evolved.

The Gasworkers' Society contained so few direct workers that there was no call for their separation from the main body. The majority of the tinplate workmen who favoured this association were skilled artisans and general labourers. None but artisans joined the Engineers' Union. Since there is no "specialisation by industry" there was no necessity for making separate provision for these classes of workmen.

It will be evident that although a highly successful

¹ Mainly metal trades, such as copper-smelting.

method of collective bargaining has been evolved, the complexity of the organisation presented an obstacle, and probably is still an unfavourable condition. The difficulties of negotiation are greater than they would otherwise be. Often a *quid pro quo* is expected by every section; a "margin for conciliation" is provided by each department. The risk of failure is increased, because each of the societies represented must be made content. A final proposal by the employers might be regarded as satisfactory by a society embracing all the workers of the trade, yet quite impossible by one of the existing societies, simply because its own members did not receive sufficiently generous treatment.¹ Moreover, as already indicated, the power of the executive over local branches is weakened by competition, and a few dissatisfied men, by threatening to transfer their allegiance to a rival society, might unduly influence the action of the central authority.

It is probable, therefore, that something would be gained by the substitution of a strong union of direct workers for the existing group. And federation with the society controlling steel workers would be a decided advantage. There is much to be said, indeed, in favour of a single union for the two industries. The recent integration movement, which was described in an earlier chapter, may seem to call for a corresponding development on the side of labour. Moreover, the connection between the tin mills and bar mills is closer, from one point of view, than that between the former and the tinhause. This fact has become more evident since the development of the sheet-steel trade.² On the other hand, the external conditions differ so much in the two industries that the same difficulties might arise as were encountered by the strike society in the nineties, when the divergence of interests between the mills and tinhause became evident.

¹ In the steel trade a recent demand for increased rates to day-men and furnacemen ultimately resulted in a compromise; the piece-workers were granted the increase, but the demand of the day-men was refused. If they had been members of different societies a compromise of such a character would have been almost impossible.

² Compare Chap V concerning American conditions.

It is not easy to detect the tendencies of the present. Long-continued prosperity favoured the retention of the existing system, which has now become deeply rooted. Nevertheless, it may prove unequal to a heavy strain.

If a change becomes necessary it is not unlikely that the two millmen's societies will be amalgamated. Evidence seems at first to point to a different conclusion, for, although acting jointly upon the Conciliation Board, they have not co-operated for the purposes of the Insurance Act. But this is really the strongest evidence in support of the view expressed above. If they had co-operated to form an approved society all excuse for continued separation would have disappeared. And the time has not yet arrived when the psychological factor ceases to count. Nor is there any valid reason why there should be two unions of piece-workers in the tinhouse. Nothing seems more natural to an outsider than that all the workmen of this department should be members of the Dockers' Society, or, if the millmen's associations were amalgamated, of the new one thus formed.

CHAPTER X

THE PRESENT AND THE FUTURE

THE last four chapters were devoted to an examination of the problem of industrial organisation. Little or nothing has yet been written to indicate the net result of such organisation in relation to the present position of the industry and of the workers engaged in it. The weekly earnings of various groups of operatives, and the general conditions under which work is carried on can best be ascertained by an examination of Appendices containing statistics of wages and hours of labour, and excerpts from a valuable report upon the conditions of employment, published in 1912. But a few general statements may be made here.

(a) The majority of the piece-workers are employed eight hours per shift (inclusive of meal times), and, two weeks out of three, five shifts per week only. This means that the mills are worked day and night from Monday morning till Saturday midday, the week is divided into sixteen shifts, and the interval of twenty-four hours into three shifts, 6 a.m. till 2 p.m., 2 p.m. till 10 p.m., and 10 p.m. till 6 a.m. These shifts are taken in rotation by the workmen, the change being made weekly; those employed in the morning shift work six days a week, the others five shifts. Day-men generally work nine and a half hours a day (fifty-four per week), annealers and assistants ten to twelve hours a day, picklers eight and a half to nine hours. Nearly half the male operatives enjoy an average working week of less than forty-three hours; about 30 per cent. are employed between fifty-four and fifty-six hours; about 10 per cent. work more than fifty-

It is not easy to detect the tendencies of the present. Long-continued prosperity favoured the retention of the existing system, which has now become deeply rooted. Nevertheless, it may prove unequal to a heavy strain.

If a change becomes necessary it is not unlikely that the two millmen's societies will be amalgamated. Evidence seems at first to point to a different conclusion, for, although acting jointly upon the Conciliation Board, they have not co-operated for the purposes of the Insurance Act. But this is really the strongest evidence in support of the view expressed above. If they had co-operated to form an approved society all excuse for continued separation would have disappeared. And the time has not yet arrived when the psychological factor ceases to count. Nor is there any valid reason why there should be two unions of piece-workers in the tinhouse. Nothing seems more natural to an outsider than that all the workmen of this department should be members of the Dockers' Society, or, if the millmen's associations were amalgamated, of the new one thus formed.

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six hours; the remaining 10 per cent. (mainly boys) are employed between forty-two and fifty-four hours per week. The wage census of 1906 contains a table (upon which the above estimates were based) indicating that considerably more than half the female workers are employed between fifty-four and fifty-six hours a week, and less than 20 per cent. under fifty hours a week. This seems an overstatement. For between one-third and one-half of the females employed are "openers" at the mills, and work about eight and a half hours each full working-day, and five to six hours on Saturday, or forty-eight hours per week.¹ The general conclusion is that, judged by present standards, the hours of employment are satisfactory for the bulk of the workers.

(b) The conditions of work are given in detail in Appendix A. The report already referred to concludes that "of the various processes necessary for the production of a tinplate, those of tinning and finishing the plate are conducted under less favourable conditions than the others. The milling operations are laborious and carried on under trying conditions of temperature; the process of pickling is disagreeable by reason of the wet floors and fumes from the acid vats (especially where these are nearly level with the floor, as is the case in some types of machine), but the workers are not in continual contact with irritating fumes and dust of the nature to which the tinhouse operatives are exposed."

In the Supplement to the Sixty-fifth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England and Wales, Part II, it is stated that "between the ages of thirty-five and forty-five the mortality of these workers is below the standard for occupied and retired males, but at every other age the standard is exceeded, the excess being most marked at the early ages. In the main working period of life their comparative mortality

¹ *Vide* "Report on the Conditions of Employment in the Manufacture of Tinplates, with Special Reference to the Process of Tinning," by Edgar L Collis, M.B., H.M. Medical Inspector of Factories, and J. Hilditch, H.M. Inspector of Factories. 1912 Cd. 6394

figure is 4 per cent. above the average. They suffer in excess from cancer, and from phthisis, and from diseases of the nervous, respiratory, and urinary systems the mortality is above the average."¹

These quotations, together with the details given in the Appendix, suggest, though they do not absolutely prove, that tinplate manufacture is a relatively unhealthy occupation. It is true that all the operatives in the tinhouse work under unfavourable atmospheric conditions. Moreover, tinmen, risers, and tinhouse superintendents inhale the fumes rising from the tinpot, and frequently suffer from gastric diseases. Again, the men employed at the rolling mills are exposed to considerable heat, and the constant handling of red-hot plates must, one imagines, affect the eyesight—although no official evidence is available upon this point. Finally, all those employed at or near the pickling machines experience much discomfort, if they do not receive real injury, from the acid fumes. But, generally speaking, it is doubtful if the conditions for most of the workers are inherently worse than in other branches of the steel and metallurgical industries. The statistical evidence adduced in the report of 1912 is too slight to provide any safe conclusions on this matter. Men employed at furnaces are apt to be careless, and to contract lung diseases and rheumatism through exposure to cold draughts; girls employed at the "opening bench," and elsewhere, often carry weights beyond their strength, and greater than they need, girls employed at the pickling machines get wet, partly through the want of suitable "uniforms," and partly through their own lack of care. Improvements are necessary in the tinhouse, but, on the whole, there seems to be little cause for complaint in other departments. It should be added that the employers, as a body, seem to observe the letter and the spirit of the Factory Acts, and the reports of the inspectors indicate satisfaction.

(c) The weekly earnings of the general body of work-

¹ Quoted in the "Report on the Conditions of Employment in the Manufacture of Tinplates," p. 19.

people are relatively high. While piece rates have remained constant for many years, the weekly incomes have steadily increased. The wages of day-men have also advanced considerably in recent years. The average wage for the industry is not materially affected by the payment of enormously high wages to a relatively small proportion. The bulk of the workmen, as the following quotation shows, are in receipt of comparatively high wages.

"The best-paid class of workmen was that of the rollers. Among rollers working the full-time week nearly one-third earned 50s. and under 60s., considerably more than one-third earned 60s. and under 70s., and nearly one-quarter earned 70s. and upwards. The average for the whole of the full-time rollers was 62s. 10d. Next came the shearers, of whom rather more than one-third of the full-time workpeople earned 50s. and under 60s., and not far short of one-half earned 60s. and under 70s., while their general average was 61s. 3d. Foremen of all classes averaged 53s. 10d. Doublers earned for the full week 50s. 9d., between two-fifths and one-half of the full-time doublers earning 40s. and under 50s., and rather more than two-fifths of them earning 50s. and under 60s. Assorters working full time averaged 50s. 5d. Among the furnace-men nearly one-fourth of those who worked the full week earned 40s. and under 45s., not far short of one-third earned 45s. and under 50s., and about one-fifth earned 50s. and under 55s.; their average was 47s. 3d. Boxers earned 45s. 1d. for the full-time week and picklers averaged for full-time 44s. 4d. If forehands, the other picklers earning 22s. 7d. The tinmen working full time averaged 43s. 6d., nearly one-third of them earning 30s. and under 40s., about one-quarter earning 40s. and under 45s., and about one-fifth earning 45s. and under 50s. Of the annealers working full time nearly one-third earned 30s. and under 40s., and a similar proportion earned 40s. and under 50s., while their general average was 41s. 11d. Of the behinders of and above twenty years of age working the full week, nearly one-third earned 20s. and under 25s., and just over one-half earned 25s. and under 30s.; their

general average earnings for full time were 26s. 9d. Except foremen and picklers, who were paid time rates of wages, the workpeople returned in all the foregoing occupations were piece-workers.

"A considerable number of *mechanics* are employed at tinplate works; this class averaged 38s. 8d. for the full-time week. The *enginemen* and *stokers* earned 34s. 3d., and *general labourers* averaged 22s. 9d. for full time.

"Among the lads and boys the most numerous class of those whose occupations are distinguished in the tabulation was that of the cold rollers, who for a full week averaged 13s. 1d. The tenders at the cold rolls averaged 9s. 7d. as full-time earnings, and the greasers 9s. 9d. The average earnings for a full week of the risers was 17s. 1d. The cold rollers, tenders and greasers were time-workers, the risers were piece-workers.

"Openers, who form the largest class among the women, averaged for a full-time week 16s. 9d. on piece work."¹

The following table indicates the percentages of workpeople in receipt of weekly earnings of different amounts, in 1886 and 1906.² Since 1906 the output of the average mill has increased, and the weekly earnings of piece-workers have advanced in the same proportion. It is difficult to estimate the extent of this increase—probably 10 per cent. is not wide of the mark.

¹ Report of "An Inquiry by the Board of Trade into the Earnings and Hours of Labour of Workpeople of the United Kingdom, 1906" Pt VI, p xxviii (Cd. 5814)

² It is assumed that the results of the investigations made by the Board of Trade were representative of the industry as a whole See Appendix B.

THE TINPLATE INDUSTRY

Earnings	Men		Lads and Boys (under 20)		Women		Girls ¹ (under 18 years)	
	1886	1906	1886	1906	1886	1906	1886	1906
Under 5s.	—	—	—	1·5	—	1·0	—	4·8
5s. ,,	10s.	—	35·7	35·2	40	10·6	100	67·6
10s. ,,	15s.	—	2·1	41·8	42·9	60	42·8	25·2
15s. ,,	20s.	16·1	5·7	22·5	13·4	—	34·9	2·4
20s. ,,	25s.	13·3	11·7	—	5·6	—	7·9	—
25s. ,,	30s.	7·1	10·5	—	0·9	—	2·8	—
30s. ,,	35s.	8·8	10·1	—	0·5	—	—	—
35s. ,,	40s.	21·5	9·6	—	—	—	—	—
40s. ,,	45s.	9·7	11·5	—	—	—	—	—
45s. ,,	50s.	17·1	11·8	—	—	—	—	—
50s. ,,	55s.	5·4	9·0	—	—	—	—	—
55s. ,,	60s.	0·3	6·8	—	—	—	—	—
60s. ,,	65s.	0·7	11·2	—	—	—	—	—
	100	100	100	100	100	100	100	100

From this it will be seen that there has been a general movement upwards, due mainly to the increase in the earnings of piece-workers. But the following table² shows that the wages of day-workers have also advanced considerably:—

AVERAGE EARNINGS FOR FULL TIME³

Occupation Men	1886		1906		Percentage Increase
	Per week	s. d.	Per week	s. d.	
Furnace-men .. Piece	34	3	47	3	38·0
Rollers .. . Piece	47	0	62	10	33·7
Doublers Piece	40	0	50	9	26·9
Shearers .. . Piece	44	4	61	3	38·2
Tinmen .. . Piece	42	4	43	6	2·8
General Labourers Time	17	5	22	9	30·6
All Men	33	5	42	0	25·7
Women					
Openers . . Piece	11	8	16	9	43·6
All Women	10	4	14	9	42·7
ALL WORKPEOPLE	22	5	32	1	43·1

¹ There has been a big displacement of females, but not altogether of the worst-paid.

² "Report into Earnings and Hours of Labour," Part VI (Cd 5814)

³ *Ibid* This comparison seems to be slightly inaccurate, for the column for 1886 gives the wages earned during a week in October, and

(d) Although a large number of young persons are employed, the system of apprenticeship does not obtain in this industry. But the prevailing method of recruiting the ranks of skilled workers is quite effective and eminently satisfactory. There are no "blind alley" occupations. The majority of the boys are employed at the cold rolls. As opportunity offers, those who are strong enough proceed to the hot rolls and commence as "behinders." They then become furnacemen, doublers, and, in the end, rollermen or shearers. And so steadily has trade expanded and the number of mills increased that the average age of "behinders" has remained relatively low. In 1910 and 1911, indeed, great difficulty was experienced in securing an adequate supply of skilled workers for the mills. The boys employed in the tinhouse become risers, then tinmen, and ultimately assorters or tinhouse superintendents. Provided the openings at the rolling mills and in the tinhouse are insufficient to absorb all the boys entering manhood, alternative employment of a less attractive character is found in the pickling and annealing departments. In short, the proportion of boys to male adult skilled workers is small enough to provide a substantial guarantee of permanent employment in skilled occupations in tinplate manufacture. Moreover, the boys receive relatively high wages from the first, and, by passing from one occupation to another, learn much of the routine of the trade, and acquire considerable experience and dexterity before they reach the most responsible and remunerative positions. The problem of education in trade schools does not arise among "direct workers" in this industry.

But an important problem, especially in view of the shortness of the working day, is to create interest in other questions, which will enable the young men to utilise their leisure in an interesting and profitable manner. And therefore includes overtime and short time. The comparison should have been made with the *average* weekly earnings for a week in 1906, *i.e.*, after making the same allowance for variations in time worked, and this would show a slightly smaller percentage increase in the wages of piece-workers.

local authorities in tinplate centres do not seem to have devoted the same attention to this problem as has been given to it by the corresponding authorities in the mining districts of South Wales. Although it is doubtful if there is a more suitable district in the country than West Glamorgan and East Carmarthenshire for such movements as the Workers' Educational Association, few facilities for general working-class education are provided in that area. But there seems to be some prospect of improvement in the near future.

(e) The trade is to a small extent "seasonal" in character. There seems to be a difference of about 15 per cent. in the total wages bill between the busiest and the slackest months. The table given in Appendix C indicates that the "swing" in employment between the same periods is approximately 10 per cent.; and this conclusion is supported by the statistics of unemployment over a series of years, published in the "Board of Trade Labour Gazette." That the wages bill fluctuates 5 per cent. more than the amount of unemployment¹ indicates—what is well known—that during slack times the work is to some extent shared among the men. When, during depression, some of the mills in a factory are closed down for repairs, or because considerations of cost necessitate such action, the operatives immediately affected take their turn with the men at the remaining mills. Until 1906 the number of mills "partially employed" was given in the statistics of unemployment published in the "Labour Gazette," but since the term "partially employed" was so elastic the figures conveyed little or no information, and, probably for this reason, were afterwards omitted. The busiest months are generally December and January; the quiet ones are June, July and August.² Since much of the product is used for canning fruit, etc., it seems surprising at first that the monthly variations are so slight. But two factors make for steadiness: first, the market is world-wide, and the seasons vary in different countries;

¹ As distinct from partial employment

² See Appendix C.

and, secondly, a tinplate is practically imperishable. The consequence of the second is that either a manufacturer will accept, during slack times, an order at a price below the normal, and the customer will purchase at that lower price and store the product until he is ready to use it; or, if the manufacturer has no orders for immediate execution, he will produce in preparation for a future demand.

(f) The character of the trade has undergone considerable change during the past eighteen years. Until the American market was captured by their rivals, South Wales manufacturers confined their attention to the requirements of existing customers, and paid little heed to possible developments. But during the depression of the nineties new markets were created and older ones began to receive the consideration they merited. Greater attention was paid to the exact needs of the customers, "odd sizes" were produced in greater quantities, and the trade in blackplate, with countries like Russia, grew steadily. Moreover, acting on the principle of insurance, some manufacturers began to make steel sheets, and others turned their attention to the production of galvanised sheets. So profitable has the trade in the latter become that in some factories tinplate has taken second place.

For these reasons the tinplate industry is now upon a firmer foundation than ever in the past. Since it is less dependent upon one market it is less liable to violent fluctuations in demand. It can never again receive, suddenly, so severe a blow as was dealt it by the McKinley tariff. It may experience keen competition in many markets in the future, and cease to grow, it may even shrink, but so big a fall in the total demand for the product as occurred in 1892 must, in future, be spread over a relatively long period, and so permit of deliberate readjustment. Another consequence of recent changes in the character of the output is that the line of demarcation between the tinplate and certain other trades is becoming blurred. It is difficult to delimit the tinplate industry, for sheet mills and galvanising mills are found

in the so-called tinplate works, alongside of tinplate mills. The result is that manufacturers may be members of the price association recently revived in the galvanised sheet industry, and also of the tinplate combination now in process of formation. In short, the industry, although still comparatively "simple," in relation to technological and economic questions, is becoming more complex. Moreover, the Siemens steel industry, which provides bars for steel-sheet and galvanised sheet mills, as well as tinplate mills, has been brought under the same financial control as the tinplate industry, and although the tendency, within limits, is now towards physical separation of the two stages of production, in the financial sense the two may almost be regarded as one industry.

It is not easy to indicate the prospects of the industry in South Wales. Undoubtedly American competition will grow keener in Canada, and, after the completion of the Panama Canal, it may be, in the Western States of South America. At the present time imports into Canada from the United States are probably sold below normal cost. To dump tinplate into the neighbouring country is an alternative to dumping bars into South Wales; and in certain circumstances is a profitable policy. For the standing charges on neither process¹ need be covered by the price of a particular order during a period of relative depression. The policy pays if the prime costs and the appropriate part of the fluctuating on-costs are covered, and a surplus is provided greater than that enjoyed by dumping bars into this country. But if the development of the United States financial policy in the future will be towards a free trade system the total cost will undoubtedly be lower than in Wales, and our manufacturers will be compelled to face a new situation. The American industry will grow rapidly, and will seek to supply the South American markets. Nevertheless, the industrial development of new countries will continue with sufficient rapidity to permit of growth in the Welsh industry in spite of the loss of these markets.

¹ The production of bars and the manufacture of plates

In Germany, too, the competing industry may be expected to grow in years to come. For that country is well suited to the manufacture of tinplate. Up to the present the output has not increased so rapidly as demand; but the cause is probably to be found in the policy of the steel and tinplate Kartels. Unlike the American trust, the German Tinplate Kartel has succeeded in preventing competition, simply because the monopoly of the Kartel controlling the raw material is so strong; and, as was indicated in an earlier chapter, immunity from competition depends upon complete monopoly in the earlier stages of production, combined with a tacit or explicit agreement between the two bodies. That the tinplate Kartel¹ has retained a monopoly of production in Germany for so long testifies to the strength of such organisations in that country.²

What the action of the Welsh manufacturers will be when increasing foreign production finds full expression, and is not counterbalanced by the growth of world demand, it is difficult to say. Probably they will develop the trade in galvanised sheets, at the expense of the competing industry in the midlands. Certainly they will endeavour to reduce cost of production more seriously

¹ The earliest of its kind. It was established in 1862.

² In their evidence as members of the commission on the Tinplate Kartel (Vol. IX of the report of the Kartel commission, 1904) the German manufacturers argued that the development of their industry was retarded by the difficulty of securing skilled workers. But the evidence is not convincing. For a time such a cause might be effective, but while the *number* of factories had not increased in forty years, the *output* of the group had increased considerably; and, while the commission was sitting, new mills were being erected in at least one of the existing factories. Obviously, if workers could be found to operate the new mills, it would not be impossible, although it might be more difficult, to obtain a supply of workmen for new factories. When the Kartel was formed there were six factories in operation. One of these was afterwards closed, and in 1904 only five firms were engaged in tinplate manufacture. Although I have seen no direct evidence bearing upon the point, it seems clear that the difficulty which a new firm would experience in obtaining raw material constitutes the real cause of stagnation. A competing firm would need to control all the stages of production, and would therefore be in active competition with all the Kartels existing in that group of industries. The conditions in America were entirely different. *Vide Chap. V*

than is now the case. First, there will be greater physical concentration. Even now the growth of the industry is mainly in the west. The smaller factories and weaker firms on the fringe will disappear. Secondly, it is likely that cheaper methods of manufacture will be adopted. Apparently these have already been under consideration, and would very soon be employed, it is said, were it not for the fear of opposition from the workmen. The disposition of the tinhouse might be altered, and greater division of labour introduced, which would mechanise the work of the tinman and call for a new workman skilled in the manipulation of the tinpots, to regulate a group of furnaces. The rolling mills would be completely re-organised and the method of working revolutionised, for the first time since the rolling mill was discovered.¹ In these ways the cost of manufacture may ultimately be appreciably reduced.

Attempts may also be made to reduce the wages of piece-workers—not necessarily the weekly earnings, but the piece rates. For, as the producing capacity of the mills increases, adequate wages, judged by present standards, will be secured with lower piece rates. And, although such reduction in labour cost would not now react upon total cost sufficiently to increase the total demand, it may, in years to come, be sufficient to affect the direction of that demand, and make all the difference between retaining and losing a particular market. For the present the total demand for tinplate is so inelastic about the ruling prices that the industry can afford the high wages now prevailing among piece-workers, while permitting high dividends to shareholders. What effect such an attempt to re-cast the standard rate would have upon the relations of labour and capital and upon labour organisation it is impossible to say. As was indicated in the last chapter, the Conciliation Board has not yet been put to the supreme test. Nor has this test yet been applied to the trade unions.

But, for some years to come the industry in South

¹ *Vide Chap. II*

Wales is likely to be relatively prosperous; and if competition among themselves can be restricted sufficiently to prevent repeated and serious over-supply, the manufacturers are likely to do as well as in the past. Moreover, with the development of the western area it is not improbable that other subsidiary trades will be created. Perhaps one of the most likely of these is an engineering industry, devoted to the making of the special kind of machinery employed in the tinplate industry. Few things are more certain than that a bright future lies before that district lying between Port Talbot and Llanelli. But one of these things is that the rate of growth will diminish in the not distant future, and that ultimately American competition will become so serious in the world market that the Welsh industry will take second place.

APPENDIX A

CONDITIONS OF EMPLOYMENT

Excerpts from *Report on the Conditions of Employment in the Manufacture of Tinplates, with Special Reference to the Process of Tinning*, by Edgar L. Collis, M.B., H.M. Medical Inspector of Factories, and J. Hilditch, H.M. Inspector of Factories (Cd. 6394)

BAR CUTTING

" . . The most frequent accidents in this process are due to bars falling on the hands or feet, and to the hands being crushed in the cutters when a short length of bar is being dealt with. The dangerous parts of the machines are generally well guarded."

ROLLING

" . . The work, which is laborious, is carried on under trying conditions of temperature, and the men wear little clothing. Temperatures of 90° F. to 110° F. have been noted at positions where the rollerman and behinder usually stand, and temperatures of 95° F. to 100° F. at points between the furnace and the rolls. The workers are also subjected to the fumes of burning lubricating grease from the hot necks of the rolls, and to coal and ash dust from the furnaces. Gas furnaces are in use in some works, and here the conditions as regards dust are better. A plenum system, blowing in fresh air just over the heads of the workers, has been introduced with beneficial results. Cold air, driven in by a fan, is discharged from a main duct by means of downcast branches above the different mills. Each branch is fitted with a valve, and the supply can be controlled by the men. Where this system is in use, the operatives have been able to continue work in summer during the hottest days. . . . They work three shifts of eight hours each, and turn out forty-five to sixty boxes of plates, or 2½ to 3 tons per shift."

" The men are liable to the following accidents: (1) Burns from hot sheets and rolls and back draught from the furnaces;

(2) injuries caused by doublers' shears (not of frequent occurrence); (3) blows from back lash of the screw pin levers; and (4) injuries due to mill-gearing (of rare occurrence).

SHEARING

" . . . The operation is carried on at the back of the rolls; one man and a boy are employed at each shears, working by day only, for about eight hours per day and five on Saturday. These operatives are exposed to the fumes of burning grease and to the dusty atmosphere of the mill, but not to the same extent as the men employed in the rolling operations. The class of accidents associated with shearing are (1) Injuries to hand or fingers caught under the shears, or trapped in cutting short pieces of metal; (2) cuts from the edges of plates and from handling the shearings.

OPENING

" . . . The workers are not unduly exposed to dust, nor to high temperatures. They work at a distance from the hot rolls where there is free circulation of air from the outside. Weights of 60 to 70 lbs. are frequently handled by workers who sometimes are not more than sixteen to eighteen years of age. The women and girls are generally clean, neat, and fairly well shod. The accidents which occur are chiefly lacerations (sometimes of a severe nature) of the hands and forearms from the sharp and burred edges of the sheets.

BLACK PICKLING

" . . Girls of sixteen and seventeen have been observed carrying weights of 50 to 62 lbs., the load having been lifted from a low pile of plates and carried to the pickling cradles some 20 feet away. The nature of the work here makes it impossible for the girls to be clean and neat. There is nothing especially dangerous about the machines used in the process, except that the vats in some cases are nearly level with the floor. The workers are exposed to wet floors, acid fumes, and general humidity due to vapour from the pickling vats.

BLACK ANNEALING

" . . The work is not of a laborious nature and the men are not exposed to the constant high temperatures found near the rolling mills. Accidents at this process are caused by (1) burns from contact with hot metal; (2) back draught in firing the furnaces, and (3) explosions of gas—where gas furnaces are used.

APPENDIX A

COLD ROLLING

" . Conditions as regards ventilation, dust and temperature are generally satisfactory, and where this department is entirely separated from the hot mills, as is often the case in newer works, the rooms are well lighted, ventilated, cleaned and periodically limewashed. Young persons, male and female, frequently carry weights of 40 lbs to 56 lbs. The class of accidents incidental to the work are (1) laceration of the hands and forearms from edges of sheets, (2) crushing of fingers between the rolls, and (3) injuries from mill-gearing, spindles and cogwheels. Those in class (2) are caused by the workers' fingers being drawn between the rolls, but rarely anything more serious than the crushing of the finger tips occurs, since the closeness of the rolls and their highly polished surfaces do not allow sufficient grip to draw in the fingers beyond the first joint. Where, however, a lead has been given by a piece of sacking, or a lad's cap (often used for wiping grease off the rolls), serious accidents have occurred involving the greater part of the hand. Serious accidents sometimes occur through the breaking of a 'false rider' i.e., a piece of cast iron placed between the end of the screw pin and the block carrying the brass bearing for the neck of the rolls. Mill-gearing accidents are generally due to the practice of getting within fenced spaces for the purpose of greasing or cleaning. Cold rolling mills are similar to the hot mills, but the housings or standards are lighter and the speed of the rolls is higher."

WHITE ANNEALING

" White annealing is done by the same men who do black annealing, and under the same conditions "

WHITE PICKLING

" The process is carried out by the same workers who do black pickling. After pickling, the plates are carefully washed in clean water and transferred to a water bath or bosh where they remain completely immersed ready for the tinning process "

TINNING

" The building in which tinning operations are carried on usually adjoins the white pickling department. Part of one end is partitioned off to form the assorting room, and the remaining portion is used for the tinning and cleaning processes. The structure is generally rectangular, the length depending on the number of sets or tinning-pots necessary to deal with the output of the mills. A tinhouse containing

twenty sets would usually have ten sets ranged on opposite sides and measure 180 to 200 feet in length, exclusive of the assorting room, from 30 feet to 50 feet in breadth, and from 28 feet to 38 feet in height to ridge of roof. A louvred ventilator above the ridge usually runs the whole length of the building allotted to tinning and cleaning. The building is lighted by windows on two sides, placed between the stacks over the tinning-pots at a height of 14 to 16 feet, supplemented in some cases by skylights. The windows are so arranged that about 4 square feet can be opened in each for ventilation. In addition, each set is lighted by two windows, about 4 or 5 feet above the floor level. Air is admitted through doorways, and through openings in the side walls. The air space, calculated from the above dimensions, would average 2,862 cubic feet for each person employed in the tinhouse. In only a few works is it the practice to limewash annually, and the general aspect of the interior is one of gloom which periodical limewashing would undoubtedly dispel. The tinning-pots are placed under arched hoods surmounted by chimneys forming the stacks. Projecting into the room outside the stacks and at right angles to the tinning-pots, are placed the branning tables and cleaning machines. The machines are driven by belting from lines of shafting erected along the whole length of the building, the motive power being either steam or electricity.

" Tinhouse workers run considerable risk of accident from (1) splashing of molten metal, zinc chloride, and grease; (2) revolving shafting, pulleys and cog-wheels; (3) chain gearing and belting, and (4) rollers on dusting machines. The accidents from revolving shafting are numerous and serious, so much so that a circular has been sent to all the manufacturers drawing attention to the danger of adjusting belts, oiling, or other work near unprotected shafts. Belt shifting and oiling are often done on a ladder or from some equally insecure position; a slip occasionally involves the operative in the shafting, pulleys, or belting.

" The workers are also exposed to fumes from the flux pot, fumes of burning palm-oil, and to dust from the material used in cleaning the plates. The tinman and riser are also exposed to high temperatures. Temperatures varying from 87° F. to 102° F. have been observed at points where these operatives work."

ATMOSPHERIC CONDITIONS

" Before the introduction of tinning machines, the range of pots was placed under a large hood of brickwork, measuring 18 to 20 feet long and 4 feet wide. The hood terminated in a chimney shaft which served the double duty of creating a

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draught for the fires underneath the pots and carrying off the palm-oil fumes. The operatives stood in a position outside the hood, and were not unduly exposed to the fumes. After the introduction of tinning machines, these were placed inside the same recesses from which the old pots were withdrawn. Horizontal machines were the first to come into general use, and as they were wider than the old style of pot, they projected beyond the brow of the hood into the tinhouse, and a considerable amount of fume escaped into the general atmosphere. Moreover, the tinman's lot was not improved, as he had to work underneath the hood.

"With the advent of these machines a substitute for palm-oil, viz., zinc chloride, commonly called flux, was introduced. Soon after, the workers began to complain of injury to health, alleged to be due to the flux, and at one works the men came out on strike. In 1891, Professor Attfield, Ph.D., was employed by the Workmen's Union to investigate the conditions under which work was carried on in the process of tinning. In an unpublished report, he stated that the atmosphere of the tinhouse was impregnated with steam from the wet plates and from flux liquor at the ports, with dust from the cleaning operations, and with fumes from palm-oil and from melted flux as the plates entered the machine. He considered at first that the fumes evolved as the wet plates passed through the molten flux possibly contained three substances injurious to health. (1) arsenic from the use of impure zinc in the making of the chloride, (2) particles of zinc chloride, and (3) hydrochloric acid. He failed, however, to find any traces of arsenic in samples taken from the work's stores, the tinman's jug, or in a sample skimmed from the tinning-pot. He concluded there was very little risk of the men inhaling fumes of zinc chloride, since laboratory experiments showed that when zinc chloride was heated in a retort beyond 650° F., the vapour was carried to a height of not more than 5 or 6 inches over the neck of the retort, and as in no case was the temperature of the molten flux in the pots found to be even as high as 500° F., indeed in several pots it was below 400° F., and further as the level of the workmen is considerably above the layer of flux. Thirdly, he found that hydrochloric acid was present in the fumes, and that the stream formed when the aqueous solution of zinc chloride was run into the flux box from time to time was free from acid at first and then became faintly acid, but the steam evolved as the wet sheets were passed through the molten flux was sufficiently acid to make a person cough who breathed the fumes. On heating some flux liquor in a retort one-fifth of its weight evaporated as ordinary acid and the third fifth decidedly acid, but the acid was not produced in irritating

proportions until the temperature rose above 35° F. to 40° F.—the usual temperature of the flux at the works. The remaining two-fifths were molten chloride of zinc. There was, however, no such liberation of the acid by stages when the wet plates were passed through the flux; all the moisture was converted into steam at once between 35° F. and 40° F. and practically the whole of the steam was acid. The production of the acid was due to a chemical reaction, zinc chloride and water becoming hydrochloric acid and zinc oxide. The acid character of the fumes afforded direct evidence of the production of hydrochloric acid, and the accumulation of zinc oxide in the flux box afforded almost equally valuable evidence. He quoted Pereira that hydrochloric acid gas affects animals even when mixed with 1,500 volumes of air, and Christison and Turner, that one volume in 20,000 volumes of air is fatal to plants. Finally, he considered that the workmen employed at the process of tinning by the aid of zinc chloride did run risks of injury to health by inhalation of air containing hydrochloric acid fumes, and he recommended that the draught in the stacks should be improved by lessening the space between the pot and the front edge of the hood. The hoods he saw had been originally constructed on the assumption that the workmen would stand in front of and outside them. If the construction of the modern machine necessitated the workmen standing inside the stack, a transverse plate should be fitted in front of his head, with a minimum of space between the lower edge of the plate and the end of the flux box below. The general draught of the existing stacks should also be improved.

"Dr Morgan, in an unpublished report to the manufacturers in 1891 on the nature of the fumes arising from the tinning-pots, says 'I was much impressed by the difference in the fumes arising from the palm-oil and from the flux. Those from the flux consist merely of steam. If you can extend the use of the flux, so as to dispense entirely with palm-oil, you will, in my opinion, confer a great boon on the workmen.'

"Following upon these reports little or no change was made in the tinhouses, and in March, 1899, Dr Legge and Mr Lewis, H M. Superintending Inspector of Factories, who was then in charge of the South Wales District, investigated the conditions prevailing. Dr Legge found that the men complained of coryza, dryness of the throat, oppression in the chest, loss of appetite, nausea, constipation and weakness of the legs. He referred to three men so seriously affected that they were obliged to cease work in consequence of working with the flux. He stood for an hour near a tinman under a hood and noticeably felt the effect of the fumes. Their acid nature was clearly shown by the reddening of litmus paper.

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Occasionally, small particles of flux spurted on the men's hands He says. ' I am unable to believe that the steam evolved on passing the wet plates into the flux does not carry up with it traces of zinc chloride '

" In a further report written in 1901, he states · ' I was able to confirm what is stated in my previous report as to coryza, dryness of the throat, of oppression in the chest, and loss of appetite as prevalent symptoms among the tinmen, and the fact that they are as a class unhealthy looking and very spare in physique.'

" Mr White (Swansea) reported in 1909 that fumes from the palm-oil caused greater inconvenience than those from the flux The hot vapours (steam and hydrochloric acid gas) may be observed to rise as a rule quickly and away from the tinman, but there is a tendency for the heavy palm-oil fumes to hang about the breathing level He further suggested that the palm-oil fumes contained traces of acrolein and acrylic acid (this opinion is confirmed by experiments in the Government Laboratory) from a chemical point of view the presence of acrolein and acrylic acid in the palm-oil is easily understood, for palm-oil is a glycerol tripalmitate, having a composition represented by the formula $C_8H_{16}(C_{16}H_{32}CO_2)_3$, which, by hydrolytic action, would yield glycerine $C_8H_{16}(OH)_3$, and this, by dehydration, would yield acrolein $CH_2CH CHO$.

" In 1910 some material, recently deposited in a tinning stack, was collected and a sample sent to the Government Laboratory, whence the following report was issued —

" ' The sample has the following percentage composition,
viz —

Moisture (<i>i.e.</i> , loss on drying at $212^{\circ} F$)	12 5
Fatty matter	20 7
Other organic substance and carbon	2 1
Mineral substance	64 7
	<hr/>
	100 0

" ' The mineral substance consists most largely of calcium sulphate, but it also contains tin equal to 2.7 per cent of metallic tin, or 3.9 per cent of tin chloride, and zinc equal to 5.7 per cent of metallic zinc or 12 per cent of zinc chloride Both chloride and sulphate are present and a considerable proportion of the metallic compounds are readily soluble in water The free acid present amounts to 0.5 per cent calculated as oleic acid, and this acid corresponds with fatty acids and is free from acrylic acid '

" This material was taken from a sheet-iron duct, about 4 feet above the surface of the tinning-pot, the duct had been fixed inside the tinning stack about twelve months previously

for experimental purposes in connection with mechanical ventilation. The substance found inside the duct, and also plentifully deposited on the surface of the walls, is of a dark grey colour almost black, and is plastic, owing to the oil fumes absorbed. It is of a caustic nature and leaves a burning sensation on the skin. Stains left on the skin are difficult to remove. The mineral substance referred to above consists chiefly of the dust used for cleaning the plates.

"At another works where an exhaust plant abstracts only the fumes from the tinning pots and so does not carry over carbonaceous matter and mineral dust, and sample of the material condensed in the depositing chamber was submitted to the Government Laboratory for analysis with the following result:—

Matter volatile at 212° F.	42 per cent.
Fatty matter	69.5 "
Non-fatty matter residue	26.3 "

"The non-fatty residue contained tin equal to 24 per cent of tin chloride and zinc equal to 3.8 per cent of zinc chloride with small traces of lead and copper but no arsenic, the percentages being calculated in each case on the original substance.

"It will be seen that the proportion of fatty matter is very high. There would be no difficulty in recovering this substance.

"At this works, where experiments are still being made, 15 cwt. of material were recovered from the chamber in ten weeks, during which period 19,618 boxes of tinplates, weighing about 950 tons, were manufactured. The value of the fatty matter, if it could be used over again for tinning purposes, may be estimated at about £14, while the tin, if recoverable, would be worth about £2. The maintenance charges for the exhaust plant and for cleaning the chambers during the same period amounted to £10.

"Dr. Bailey (Swansea), one of the Inspectors under the Alkali Act, kindly made a few tests of the fumes in 1910, with the following results—

Composition of smoke Collected 12 inches above the Surface of a pot upon which Grease was Burning.

(1)	Test 1 (2)	Test 2 (3)
Total acidity equivalent to grains SO ₃ per cubic foot	0.060	0.130
Chlorides stated as grains HCl per cubic foot	0.093	0.133
Oxides of Tin Traces, not estimated	. Traces, not estimated

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Composition of Gases, Normally Existing above Horizontal Pots at Work

	(1)	Test 1 (2)	Test 2 (3)
Total acidity equivalent to grains SO ₃ per cubic foot		0.060	Trace
Chlorides stated as grains HCl per cubic foot		0.020	0.004
Inorganic matter insoluble in nitric acid, and taken as grains SnO ₂ per cubic foot		0.010	Trace

"The quantity of air drawn from above the separate pots in each test was one cubic foot, and was taken, approximately at the height of the workman's face, at the stack end of the pot where maximum results might be expected. Tin and zinc compounds soluble in water, if present, were so minute as not to be detected with certainty in one cubit foot of the gases."

"The conditions in many of the works are now much the same, both as regards fumes and dust, as they were during the inquiry of Dr. Legge and Mr. Lewis in 1899. It must, however, be remembered that at that time (May, 1899) the trade was under a cloud, and many of the works were standing idle. Several suggestions were made for improvements which comprised (1) lowering the front arch of the brow of the stack, (2) means for protecting the machines from rain, other than blocking up the chimney stack; (3) restriction of the area of the flux box by fitting curved guides to direct the fumes from the tinman's faces, (4) fitting a transverse partition in front of the tinman when he has to stand inside the stack; and (5) limitation of period of employment to eight hours for persons dipping plates in the flux."

"Personal experience of operatives, stated later, demonstrates that the present conditions are trying, and cause physical discomfort, to those who are continuously exposed to the action of both kinds of fume and to the dust given off in the cleaning operations."

CLEANING AND DUSTING

"The sheets after tinning require to be cleaned and dusted before they are packed. Originally these processes were done by hand, and hand cleaning is still carried on in a few works for the production of some of the better qualities of tinplate. This is done at wooden tables which stand out at right angles to the tinning-pots. The back of the table is boarded up to a height of 3 or 4 feet, and the cleaning material, consisting of 'shudes' and 'sharps' (sweepings of flour mills) is heaped up against it. The operative takes the greasy sheet

still hot from the track where it has been placed by the riser, passes it through the layer of cleaning material and, with a pad of sheepskin, cleans and polishes it. Dust is given off in the process, and the operative becomes quickly covered with a deposit of the material. The work is generally done by women and female young persons. Cleaning and dusting machines have largely replaced hand cleaning and, where these are in use, the riser at the tinning-pot passes the plate directly into a machine, consisting of slowly revolving arms which carry it through a bed of some absorbent material to remove the grease adhering to the surface. From this machine the plate is carried to a dusting machine where it passes through a series of revolving rollers, covered with sheepskin, which clear off the dust and give the plate a fine polish. A modification of the cleaning process consists in attaching the dusting machine to the end of the cleaning machine so that the plates, slowly emerging from the cleaning machine, are guided through successive pairs of rubber and sheepskin covered rollers and delivered bright and clean on to a receiving stand. With this arrangement the duster—usually a male or female young person—is not required.

"Dust is given off both from the cleaning and dusting machines which are practically open, and is carried into the general atmosphere of the tinhouse and deposited on the beams of the building and on the walls and floors. The cleaning material used in the machines consists of 'pink meal,' a mineral spar, finely ground. This is used alone, or mixed with sawdust, soot, or dust from the boiler flues. In some works a little paraffin is used to moisten the mixture, but where the plates are intended for the canning of food stuffs this is objectionable. Water is also used to moisten the mixture. In 1901 samples of the dust were collected and were microscopically examined by Dr. Legge. He found considerable quantities of gritty material present, which, although not actually poisonous when inhaled, would probably have a deleterious effect on the membranous lining of the respiratory passages. One sample of dust examined was found to consist of pure wheaten flour."

ASSORTING AND PACKING

"The subsequent processes, viz., assorting, reckoning, boxing, etc., call for no special comment. They are usually carried on in a building adjoining or forming part of the tinhouse. The assorting rooms are generally clean, well lighted and ventilated, and there is nothing in the process different from the assorting and packing of other goods. The work is clean and light in character. Females, and men promoted

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from being tinmen are employed. The usual working hours are eight or nine on ordinary week-days, and six on Saturdays. Where the practice of carrying the plates from the tinhouse to the assorting benches prevails, heavy weights are often handled by young girls. This is avoided in many works where the plates are run into the assorting rooms on small trolleys."

TINNING AND FINISHING

"The processes carried on in the tinhouse have already been described, but emphasis must be laid on the facts that (a) risers are more exposed to dust and to oil fumes than other operatives; (b) tinmen are exposed more to flux flames, and less to dust than risers, and (c) assorters,¹ who have passed out of the tinhouse, are not exposed to either dust or fumes."

¹ "Assorters do not work in the tinhouse itself, but as their form of employment follows in sequence after that of tinmen, and all assorters have been tinmen, it is convenient to class them in this report as tinhouse operatives."

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(1) The Age Constitution¹, (2) The percentage of Deaths² due to all Respiratory Diseases and Phthisis, (3) The Median Age at Death, and (4) The Average Age at Death³ calculated from Death Certificates*

Occupation	Age Constitution					Median	Average	Total number of Deaths on which average is based
	Total 15 and upwards	15-	25-	35-	45-			
Farmer, grazier	1000	192	188	187	168	147	118	20 0
Gardener, nurseryman	1000	224	205	182	161	129	89	25 3
Occupied Males (Agricultural districts)	—	—	—	—	—	—	—	—
Shoemaker	1000	280	211	185	144	106	74	24 9
All males (England and Wales)	1000	268	289	181	195	108	71	36 0
Blacksmith	1000	294	288	185	138	87	68	30 7
Carpenter, joiner	1000	283	280	188	153	96	40	81 0
Taylor	1000	322	197	184	151	98	48	29 8
Cutter, scissors maker	1000	273	268	191	124	84	56	35 4
Bricklayer, mason	1000	243	245	208	104	108	44	47 8
File maker	1000	266	228	204	170	100	97	86 7
Tinplate goods maker	1000	333	247	199	122	65	29	38 5
Risers, turners, assorters	—	—	—	—	—	—	—	—
Doublers, furnacemen and assistants, hot-rollersmen	—	—	—	—	—	—	—	—
Other workers	—	—	—	—	—	—	—	—
Not stated	—	—	—	—	—	—	—	—
Occupied Males (Industrial districts)	1000	307	260	195	136	74	28	87 8
Coal miner	1000	384	279	189	123	59	16	80 9
Furnacemen	—	—	—	—	—	—	—	—

¹ Extracted from Table VI of the Supplement to the Registrar-General's Sixty-Fifth Annual Report, 1908.

² Calculated from data given in the Supplement to Registrar-General's Sixty-Fifth Annual Report, 1908.

³ These are figures for Sheffield, given by Dr. Scovell in evidence at the Grubing's Inquiry, 1899, except those for Tinplate General, which are based on 360 Certificates of Deaths which occurred 1890-1892, supplied by the Registrar-General.

* From Report on Conditions of Employment by Edgar L. Collis, M.B., and J. Hilditch

APPENDIX B

NET EARNINGS OF WORKPEOPLE IN THE UNDERMENTIONED OCCUPATIONS IN THE LAST PAY WEEK OF SEPTEMBER, 1906¹
SOUTH WALES, MONMOUTHSHIRE, AND GLOUCESTERSHIRE

Occupation	Workpeople who worked Full Time		All Workpeople (including those who worked less or more than Full Time)	
	Number (of cases investigated)	Average Earnings for Full Time	Number (of cases investigated)	Average Earnings of all Workpeople
MEN (of and above 20 years of age)				
Foremen	Time	148	53 10	152
Furnacemen	Piece	659	47 3	788
Rollers	Piece	677	62 10	800
Doublers	Piece	651	50 9	783
Behinders	Piece	571	26 9	680
Shearers	Piece	289	61 3	255
Annealers	Piece	407	41 11	417
Picklers : Forehands	Time	40	44 4	40
Others	Time	61	22 7	62
Tinmen	Piece	647	48 6	794
Assorters	Piece	215	50 5	228
Boxers	Piece	142	45 1	144
Mechanics.	Time	181	38 8	253
Enginemen and Stokers	Time	260	84 8	296
General Labourers	Time	858	22 9	448
Other men	Time	586	28 5	655
" "	Piece	487	29 8	482
All men		6,274	42 0	7,277
				40 1
APPRENTICES (all ages) and LADS and Boys (under 20 years of age)—				
Full Timers				
Behinders	Piece	67	22 0	94
Cold Rollers	Time	389	18 1	403
Tenders	Time	845	9 7	383
Greasers	Time	148	9 9	190
Risers	Piece	200	17 1	272
Other Lads and Boys	Time	653	11 0	609
" "	Piece	86	12 11	105
All Lads and Boys		1,888	12 4	2,146
				11 11
WOMEN (of and above 18 years of age)—				
Openers	Piece	538	16 9	587
Other Women	Time	898	12 4	461
" "	Piece	110	18 5	117
All Women		1,041	14 9	1,165
				14 3
GIRLS (under 18 years of age)—				
Full Timers :				
All occupations	Time	239	8 8	279
" "	Piece	50	9 8	54
		289	8 10	333
				8 6

¹ From Report of an Inquiry by the Board of Trade into the Earnings and Hours of Labour of Workpeople of the United Kingdom Vol VI [Cd 5814]

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PERCENTAGE OF WORKPEOPLE IN THE UNDERMENTIONED OCCUPATIONS WHOSE NET EARNINGS, IN THE LAST PAY WEEK OF SEPTEMBER, 1906, FELL WITHIN THE UNDERMENTIONED LIMITS¹

Occupation	MEN										PIECE-WORKERS			
	Under 20s	20s and under 25s	25s and under 30s	30s and under 35s	35s and under 40s	40s and under 45s	45s and under 50s	50s and under 55s	55s and under 60s	60s and under 65s	65s and under 70s	70s and under 75s	Total under 75s	Average Number Earnings
PERCENTAGES, INCLUDING SHORT TIME AND OVERTIME.														
Furnacemen	2.0	1.4	3.9	6.5	10.0	22.5	26.7	16.8	7.2	1.9	0.6	0.5	—	100.0
Rollers ..	2.0	0.9	0.7	2.1	8.1	4.8	5.6	11.5	17.0	18.9	13.0	12.3	8.1	100.0
Doublers	3.1	1.1	3.8	8.8	6.6	16.2	23.6	19.5	15.0	5.8	2.0	0.6	0.4	100.0
Behnders	14.2	28.1	42.9	11.5	2.5	0.6	0.2	—	—	—	—	—	—	100.0
Shearers	1.2	0.4	2.0	1.2	0.4	4.3	2.7	12.5	20.0	26.3	16.9	8.2	8.9	100.0
Annealers	0.7	1.9	10.6	17.7	14.9	17.7	14.6	8.7	5.5	4.1	0.7	1.7	1.2	100.0
Tuners	5.2	4.4	5.9	13.6	16.1	20.8	16.1	12.0	8.9	1.2	0.4	0.4	—	100.0

I. From Report of an Inquiry by the Board of Trade into the Earnings and Hours of Labour of Workpeople of the United Kingdom. VI. Metal, Engineering, and Shipbuilding Trades in 1906 [Cd. 5844]

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TABLE SHOWING FOR MEN, LADS AND BOYS, WOMEN AND GIRLS, THE PERCENTAGE EMPLOYED, THE AVERAGE WEEKLY RATES OF WAGES, AND HOURS OF LABOUR, ETC., IN 1886.¹

	Percentage of Total Employed	Average Weekly Rate of Wages	s d	Percentage Number paid by Time	Usual Weekly Hours of Labour, exclusive of Meal-times
Men	52 2	38 5	87	63 0	' 44 to 48 for Rollers, Doublers, Heaters and Catchers, 62 and 68 for Puddling workers ; about 60 for Mechanics, and the remainder from 52 to 60 (including Shearers, Plate Weighers, Cold Rol- lers, Picklers, Timmen, Washers, Assorters, An- nealers, etc., and their various assistants)
Lads and Boys	24.1	11 8	50 8	49 7	
Women	17 5	10 4		21.5	
Girls	6 2	6 11		78 5	
	100 0	—	22 5	36 5	63 5
					—

¹ From General Report on the Wages of the Manual Labour Classes in the United Kingdom, with Tables of the Average Rates of Wages and Hours of Labour of Persons employed in several of the Principal Trades in 1886 and 1891 [Cd. 6889]

APPENDIX C

TOTAL NUMBER OF WORKPEOPLE PAID WAGES AND AMOUNT OF WAGES PAID IN THE LAST PAY WEEK OR OTHER ORDINARY WEEK IN EACH MONTH OF 1906 BY FIRMS FURNISHING RETURNS, TOGETHER WITH THE TOTAL AMOUNT OF WAGES PAID BY SUCH FIRMS IN 1906

Month	Number of Workpeople Paid Wages	Percentage of Average Weekly Number	Weekly Wages Bill	Percentage of Average Weekly Wages Bill
January .	10,594	103 4	£ 15,996	102 9
February .	10,596	103 4	16,859	105 2
March .	10,420	101 7	15,826	101 8
April .	10,233	99 9	15,297	98 4
May ..	10,112	98 7	15,369	98 9
June .	9,864	96 3	14,590	98 0
July .	9,605	93 7	14,039	90 3
August .	9,964	97 2	14,441	92 9
September .	10,197	99 5	15,625	100 5
October .	10,370	101 2	16,257	104 6
November .	10,458	102 0	16,482	105 7
December ..	10,556	103 0	16,308	104 9
	10,247	100 0	15,545	100 0
Aggregate Wages Bill for the Year			£ 762,794	

APPENDIX D

LOCATION OF TINPLATE WORKS IN GREAT BRITAIN

From "Journal of Iron and Steel Institute," 1893. "The Origin and Progress of the Manufacture of Tinplates"—P. W. Flower.

**Excerpt Minutes of Proceedings of Meeting of
the Institution of Mechanical Engineers in Carduff,
Aug 1, 1806 "The Manufacture of Templates,"
by R. BEAUMONT THOMAS. M. I. Mech. E.**

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AVERAGE NUMBER AND DISPOSITION OF OPERATIVES IN TINPLATE MILLS¹

Process	Number of Operatives for a Plant of											
	18 Mills						6 Mills					
	Adults		Young Persons		Total		Adults		Young Persons		Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Bar cutting	11	—	—	—	—	11	4	—	—	—	—	4
Furnace work and doubling	108	—	—	—	—	108	36	—	—	—	—	36
Rolling and bending	108	—	—	—	—	108	62	—	—	—	—	36
Shearing and bundling	18	—	—	—	—	47	6	—	—	—	—	14
Opening	—	—	85	—	9	44	—	—	14	—	—	18
Pickling (black and white)	..	6	15	—	19	40	4	5	—	—	—	4
Annealing (black and white)	40	—	—	—	—	40	11	—	—	—	—	11
Cold rolling	4	—	82	7	98	4	6	10	15	—	—	85
Tinning and rising	100	—	34	—	184	89	—	7	—	—	—	46
Cleaning and dusting	..	—	8	—	5	13	3	—	—	—	—	10
Assorting and reckoning	..	18	6	—	—	24	6	8	—	—	—	9
Boxing	..	18	—	—	—	18	5	—	—	—	—	5
Mechanics, enginemen, labourers	140	—	10	—	—	150	35	—	8	—	—	48
Other spare hands	..	18	2	6	2	28	6	1	2	1	10	10
Totals	584	68	161	42	853	191	29	89	31	290		

¹ From Report on the Conditions of Employment in the Manufacture of Tinplates, with Special Reference to the Process of Tinning, by Edgar L. Collis, M.B., H.M. Medical Inspector of Factories, and J. Hinditch, H.M. Inspector of Factories [Cd 6394].

APPENDIX E

TOTAL ANNUAL EXPORT OF TINPLATES

From Porter, "Progress of the Nation," 1851. (Murray, London.)

Year	£
1815	275,136
1816	289,390
1817	239,062
1818	277,458
1819	167,843
1820	160,671
1821	161,299
1822	175,280
1823	209,143
1824	233,115
1825	185,251
1826	228,460
1827	281,958
1828	245,453
1829	212,526
1830	231,922
1831	215,446
1832	231,652
1833	268,742
1834	324,559
1835	381,076
1836	387,951
1837	371,848
1838	459,176
1839	372,026
1840	360,816
1841	390,621
1842	368,685
1843	427,994
1844	506,691
1845	637,507
1846	659,851
1847	485,078
1848	558,175
1849	727,825

APPENDIX E

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TOTAL ANNUAL EXPORT OF TINPLATES

(From Annual Statement of Trade of United Kingdom with Foreign Countries and British Possessions)

Year.	Cwts.	£
1850	709,788
1851	927,202
1852	1,018,951
1853	1,181,069
1854	1,087,958
1855	1,110,848
1856	1,407,906
1857	1,500,116
1858	1,851,151
1859	1,522,618
1860	1,500,812
1861	907,947
1862	1,212,665
1863	1,809,678
1864	1,268,246
1865	1,254,867
1866	1,419,578
1867	1,578,121
1868	1,768,128
1869	1,984,084
1870	2,362,872
	Tons	
1871	2,900,625
1872	3,806,978
1873	3,953,042
1874	3,714,810
1875	3,686,607
1876	2,891,698
1877	3,088,126
1878	2,782,378
1879	3,507,977
1880	4,457,887
1881	4,168,182
1882	4,642,125
1883	4,705,408
1884	4,746,928
1885	4,427,695
1886	4,788,588

APPENDIX E

TOTAL ANNUAL EXPORT OF TINPLATES.—(Continued.)

Year.		Tons.	£
1887	358,506	4,792,854
1888	391,861	5,546,228
1889	480,650	6,080,005
1890	421,797	6,861,477
1891	448,879	7,166,655
1892	395,449	5,830,216
1893	370,172	4,991,800
1894	358,928	4,888,786
1895	366,120	4,289,193
1896	266,698	3,036,015
1897	271,820	3,038,569
1898	250,953	2,744,077
1899	256,873	3,168,614
1900	272,877	3,976,796
1901	271,820	3,704,088
1902	{ 811,868 812,206	4,888,166 (a) 4,887,688 (b)
1903	292,800	3,958,648
1904	359,684	4,595,568
1905	354,864	4,566,984
1906	374,802	4,986,868
1907	405,828	5,917,104
1908	402,869	5,480,075
1909	489,747	5,767,951
1910	482,981	6,545,024
1911	484,881	6,848,851
1912	481,128	6,888,292

¹ (a) From volume issued in 1903 (b) From volume issued in 1904 (larger export to France

APPENDIX F

TABLE SHOWING THE CHANGES IN THE RELATIVE IMPORTANCE OF SOME OF THE CHIEF MARKETS¹

	1870	1880	1890	1900
	Tons	£	Tons	£
United States of America	155,595	2,768,660	380,689	4,674,455
Russia	816	14,993	15,918	220,500
France	4,936	80,150	4,921	62,655
China and Japan	888	14,878	812	11,648
British North America ..	5,860	107,700	15,384	214,155
Australasia	2,463	46,388	6,680	98,868
Total to Foreign Countries ..	—	—	408,435	5,644,849
Total to British Possessions .	—	—	27,215	385,956
			51,851	650,662
			108,980	1,410,280

¹ Figures taken from Annual Statement of Trade of United Kingdom with Foreign Countries and British Possessions

APPENDIX G

SOURCES OF INFORMATION

It is almost impossible to indicate all the sources from which information has been obtained. Little of value has yet been written upon the economics of Welsh manufacturing industries, and although a long list of books and pamphlets might be given in which brief references are made to the steel and tinplate industries, I cannot recall a single modern volume to which I am deeply indebted. The works of Professor Levy and Messrs Macrosty and Carter touch upon the combination movement in the tinplate industry, but none of these references seems to have been based upon close investigation of satisfactory evidence.

The chapters dealing with modern conditions are based upon personal investigation, and, wherever possible, upon an examination of official documents, such as the minutes of the Conciliation Board, trade union reports, etc. In this connection I may especially refer to the "Industrial World" (at first called the "Industrial Times") 1888-1898, a weekly paper controlled by, and published in the interests of the tinplate workmen's union. No student of Welsh economic history can afford to neglect this source.

For material upon the period ending 1888 I went through all the volumes of the "Cambrian" (a Swansea weekly newspaper), "Engineering" and "The Engineer." For further information and the expression of different views upon labour disputes, I consulted the Llanelli and Swansea daily and weekly newspapers. Flower's "History of the Trade in Tin and Tinplate" contains miscellaneous information upon this period, although it is largely devoted to technological questions.

When dealing with the period of foreign competition I searched the pages of the "South Wales Daily News," the "Iron and Steel Trades Journal," the "Iron and Coal Trades Review," and the "Industrial World," and referred frequently to local newspapers. The "Iron and Coal Trades Review" proved the most useful publication for the purposes of chapter seven. But I know no journal which does full justice to the claims of Welsh manufacturing industry.

The Transactions of the Royal National Eisteddfod of Wales, 1883, contains an excellent article upon the history of the industries of Pontypool, where the first tinplate factory was erected, while the Official Guide and Handbook to Swansea District, 1880, published on the occasion of the visit of the British Association to that town, contains an interesting account of the method of tinplate manufacture (by the late Mr Daniel Edwards), as well as articles upon the metallurgical industries of the neighbourhood.

Dr. Ure: "Dictionary of Arts and Manufactures" should also be consulted for technological history during the first half of the nineteenth century. Frequent references have been made in the text to Andrew Yarranton's account of the possibilities of the tinplate industry in the seventeenth century.

The most useful Government publications are the Wage Census of 1886, the Report of the Labour Commission 1892-4, the Report on the Depression of Trade, 1895-6, the Report on Collective Agreements, 1910, the Wages Census of 1906, (Pt. VI), the Report on the Conditions of employment in the Manufacture of Tinplate 1912, and the evidence given before the Industrial Council during its inquiry into industrial agreements, 1912. But all the annual publications of the Board of Trade were consulted. Consular reports sometimes contain references to markets in foreign countries, but almost all of those consulted were disappointing.

Considerations of space made it necessary to curtail the treatment of the American industry and to omit a section dealing with the German kartel. But the following sources were examined and proved useful. On America, the Report of the Industrial Commission (1899-1901), the Report of the Commissioner of Corporations on the Steel Industry (1911-12, three volumes), and the Report on the United States Census, 1901. "Die Stahlindustrie der Vereinigten Staaten von Amerika," by Professor Hermann Levy, contains a long chapter upon the growth of the American industry, while two articles in the Yale Review by Mr. F. McVey are reprinted in Ripley: "Trust, Pools and Corporations." Information upon the German industry was obtained from Verhandlungen über Deutsche Kartelle 1905 (vols. 9 and 10), and two journals, "Stahl und Eisen" and "Kartel Rundschau."

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